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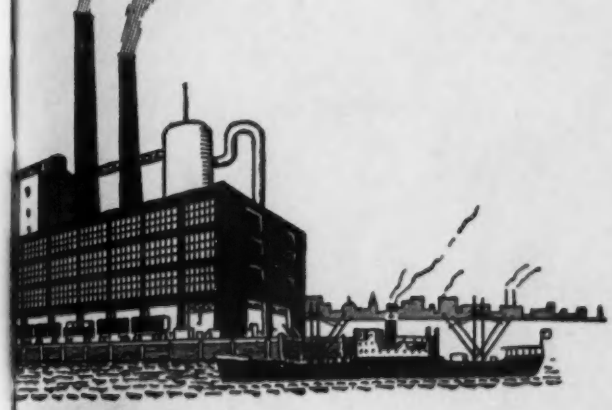

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ECONOMIC GEOGRAPHY

VOL. 26 OCTOBER, 1950 NO. 4

THE CENTRAL BUSINESS DISTRICT—A STUDY IN URBAN GEOGRAPHY

George W. Hartman

Dr. Hartman received his Ph.D. degree from the State University of Iowa where he is now assistant professor of geography. His paper, an outgrowth of his doctoral dissertation, is representative of his field of special interest.

ONE of the more important phases of the study of urban communities is that which deals with the spatial, internal structure of urban centers. The geographer is concerned directly with the distributive arrangement of the activities within each city, and he undertakes an analysis of the structure of individual cities. A comparison of the results of a large number of such studies indicates that individual structures have certain basic elements and associations in common. Patterns and repetitious associations have been distinguished and stated in terms of general types and of general tendencies.[1] The latter, in turn, become valuable guideposts for a more precise measurement of variations and modifications found in each city.

This paper is devoted to a consideration of one phase of the internal structure of cities—namely, an analysis of the central business district. The basic portions of this report are the result of an examination of existing land-use maps and related studies of approximately 40 cities in the United States. These cities present important variations in geographic location, physical site, functions performed, age, and population size. It is impossible to obtain data for all existing cities, and for that reason the statements that follow undoubtedly will be subject to later modification.

PRIMARY CHARACTERISTICS OF THE CENTRAL BUSINESS DISTRICT

The first substantial developments of "towns and cities" in the United States generally were made at locations and sites most advantageous to trade and commerce. Whether an urban community was established at a junction of overland trade routes, along a navigable stream or water body, at some other inland break-of-bulk or change-of-ownership transportation site, or at some strategic point favorable for mining, manufacturing, or resort activities, the primary focus of internal activities and the major contact with a tributary area was found in the "business district."

As a consequence of offering services not only for the dwellers of the city itself but also for the inhabitants of a larger rural territory and often of a much farther-flung hinterland, the location of the business district with respect to these potential customers is generally predictable. The underlying determinant of the use of the land base is

competition for *strategic* space, and the strongest competitors of all (as shown by the ability to pay higher rents) are the commercial establishments. To the business man dispensing or facilitating the exchange of goods and services, the most advantageous location with respect to *all* activities is in the very midst of those activities. On a uniform land base and without deformation by man-made irregularities, the exact geographical center therefore becomes the most desirable site. The result of such desires and abilities is reflected in land-use maps by the centralized position of the business district in relation to other activities and facilities, and by the intensive commercial use made of the land base in the district.

All types of goods and services may be offered in the central district, but the simplicity or complexity of facilities depends primarily upon the number and kind of customers. In small urban centers of agricultural districts, for example, low-cost necessity or convenience goods and non-specialized services are most frequently encountered. Larger cities, on the other hand, offer additional facilities to a larger clientele. As a city grows in size and importance, the central district tends to assume more and more the function of a shopping and style center as well as of a specialized personal and professional service district. A statement found in a recent study by the United States Department of Commerce is of significance in this respect: in large districts department stores oftentimes are dominant in total sales, but they are always outnumbered by narrow-line shopping stores which specialize in the sale of goods such as shoes, dresses, hosiery, and men's clothing.[2]

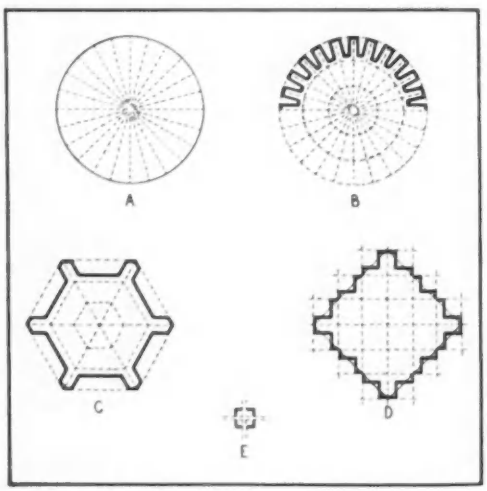

FIG. 1. Geometric patterns of the central business district.

GEOMETRIC PATTERNS OF THE CENTRAL BUSINESS DISTRICT

The Circle.—The actual shape of the central business district varies considerably from city to city. The variations, however, are the result of local conditions and do not stem from a multiplicity of patterns. The concentric zone hypothesis as outlined by Burgess[3] suggests that, in the absence of topographical or man-made barriers, the geometric pattern is a circle (see Fig. 1-A). This belief appears to be based upon measurement of relative distances from the center: each point on the periphery of a circle is as close to the center as any other point similarly situated, and with the desire for central position on the part of commercial activities the entire business district assumes a circular shape around the central point.

It might be argued that developing idealized shapes on the basis of distance measurements alone is of questionable value in that the importance of relative time involved in travel from one point to other points is ignored. That time and distance factors are not synonymous in reality hardly needs demonstrating here. The time-distance relationship as affecting business district configurations, however, is an exceedingly variable one,

and such variations will be considered later under the heading "Variations from Idealized Shapes."

The Star-Like Pattern.—Actual movements of goods and people, however, ordinarily cannot follow the shortest air-line paths to and from the center. To accomplish this end, it would be necessary for every portion of the area to be a part of some straight-line route to the center, an impracticable and impossible feat because of the presence of buildings and other space occupiers. Only the streets and sidewalks may be used. The circular pattern is most nearly approached in actuality where the major transportation routes are of the radial type, and then only if the number of radial streets is very large (Fig. 1-B). The periphery of the central district reaches its greatest outward extent along each of the radial streets, and consequent inward sagging occurs in the interstitial areas. The width of these interstitial zones varies inversely with the number of routes to the center; an actual circular shape requires innumerable radial streets.

As the number of radial thoroughfares decreases, however, the peripheral configuration becomes less circular and the areas where sagging occurs become larger and larger. A small number of such streets imposes a pattern which is more star-like in shape (Fig. 1-C). It may be noted, therefore, that circular and star-like patterns are similar in nature. They differ only in the number of radial thoroughfares assumed.

The Diamond Pattern.—Many of the cities in the United States have not developed under a system of radial streets. A large majority have developed under the grid or gridiron method of platting streets and blocks. Even in cities that now have a certain number of radial thoroughfares superimposed on the original grid to ease the flow of traffic, the thoroughfares generally terminate at the periphery of the district with the latter retaining the rectangular plan. It may be noted that under such a system, two of the streets may be considered to be radial since they intersect at the center. The important difference, however, is that a larger choice of alternate shortest-distance routes is offered under the grid.

Again assuming that central location is desirable, if equal distances from the center are measured along all possible routes of travel, a pattern is outlined which resembles a tilted square or a diamond with each of the four corners resting on one of the direct-route streets (Fig. 1-D).

Finally, if the star or diamond patterns are reduced to their simplest form (i.e., a minimum number of business establishments in which symmetry of shape is maintained), the resultant geometrical pattern becomes identical with that associated with nucleated hamlets—the crossroads square (Fig. 1-E).

CORRELATION OF BUSINESS DISTRICT AND TRADE AREA PATTERNS

Recognition has been given to the fact that the spatial shape of the central district develops not only in response to the needs of the city dweller but also of the people living in the trade area around the city. The latter becomes particularly important in agricultural areas where a significant portion of the total customers of commercial enterprises resides outside the city. While a detailed analysis of such relationships is beyond the scope of this study, the following considerations are believed to be pertinent.

The Hexagon and Circle.—Under the apparent assumptions of a homogeneous land base, equal distances between villages, towns and cities, air-line or shortest-distance routes of travel, and a rural

population that has no preference except to frequent the nearest urban community, it has been demonstrated that the hexagon rather than the circle is the ideal trade-area configuration.[4] The hexagonal pattern is most efficient as it leaves no interstitial areas unserved. The shape of the business district presumably is affected by that pattern, particularly if the rural inhabitants constitute a significant portion of the total customers being served. If one ignores for the moment the necessity of streets and buildings, the circular pattern of the central district is most efficient in serving the hexagonal trade area (Fig. 2-A).

The Hexagon and Star.—If the assumption of air-line routes of travel is replaced by one of a system of radial highways and streets converging in the various business centers, the hexagon remains as the ideal trade-area configuration even though "zones of indifference" appear along the margins (Fig. 2-B). It has been demonstrated previously, however, that the central district no longer maintains a circular shape under such a street system. The star-like district best serves the inhabitants of the city and of the hexagonal tributary area under a regular system of radial thoroughfares.

The Square and Diamond.—Wendell Smith,[5] in investigating the State of Iowa for merchandising possibilities, points out that if a regular grid system of highways and streets is assumed, cities cannot be equally spaced and their trade areas ideally assume the shape of a square (Fig. 2-C). The square pattern appears to be applicable in many sections of the United States because the rectangular method of land survey theoretically would tend to produce a north-south, east-west alignment of transportation routes and cities. Under such conditions, rural customers travel to and from the centers of cities principally by the two converging streets of the usual grid system. The diamond pattern appears to be more efficient in serving the square-like hinterland, as the farthest extensions of the central business district are along these streets.

As land-use maps of various cities indicate, linear commercial developments often appear along the main thoroughfares for considerable distances beyond the central core. This development appears to be the result of a desire on the part of certain establishments to obtain more space for their activities and particularly to move out in the direction of the greatest number of concentrated customers. Such extensions, however, are not considered as a part of the central business district as true *central* location no longer is maintained with respect to *all* potential customers.

VARIATIONS FROM IDEALIZED SHAPES

Geometric patterns of central business districts have been presented above as idealized, spatial arrangements of commercial activities under certain basic

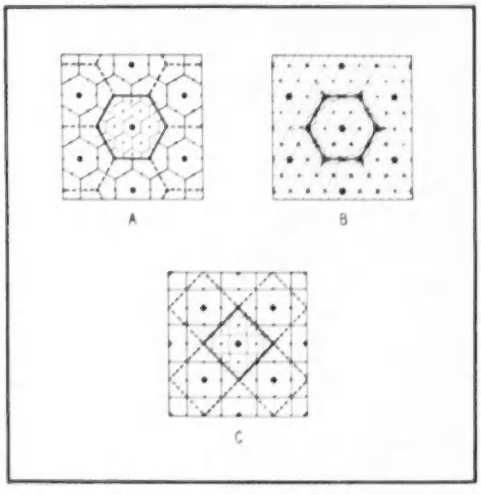

FIG. 2. Related geometric patterns of the central business district and trade area.

assumptions. These assumptions may be restated in clearer form: a homogeneous land base, unity and regularity of a radial or grid transportation system with arteries of travel that have equal strength in facilitating the flow of traffic, recognition on the part of commercial enterprises of the desirability of central position with respect to all potential customers, and symmetrical development of the central district unfettered by man-made distortions.

An analysis of actual business districts, however, indicates that local conditions impose modifications of these assumptions. No district actually conforms in all respects to any one of the theoretical shapes; in fact, most districts evidence a number of distorting influences. In brief, asymmetrical rather than symmetrical shapes result in local variations in each city (see Fig. 3 for six examples of the districts studied).

The Physical Site.—Irregularities of the land base have important influences on the shapes of central districts even though in some cities expensive alterations of the site have been undertaken. It is generally understood that customers dislike to walk up slopes so preference is made for level ground or at least slight relief. Costs of building construction also vary considerably according to site conditions with the result that certain sites have preference over others. Low-lying areas adjacent to water courses usually are avoided by commercial interests because of drainage and flood control problems. Rivers, canals, lakes, bays, underlying surface conditions, and abrupt variations in relief have important effects on the configuration of the central district in most cities.

A level area immediately surrounded by formidable barriers to outward expansion tends to compress commercial nucleation, resulting in more intensive and vertical use of the land (e.g., Johnstown, Pa.). On the other hand, a steep, narrow valley site may have the effect of weakening central growth by forcing inordinate elongation of the central district (Fitchburg, Mass.). A lowland area with several low-level approaches may be effective in combining nucleation with linear star-like extensions (Syracuse, N. Y.). If competition for space in the central district becomes acute in the face of a physical barrier, double nucleation or an interrupted district may develop. Little Rock, Ark., and Waterloo, Iowa, districts, for example, have interruptions necessitated by a river barrier.

The physical site also indirectly affects shapes of central districts by influencing other variables such as street platting methods and the direction and volume of traffic flow.

Platting Methods.—Alterations in the basic street and block plan in many districts tend to distort the tendency for symmetrical shape. Irregularities in the length, direction, and width of streets coupled with the size and shape of blocks are particularly effective in influencing the shape of the districts in Reading, Pa., and Savannah, Ga. They also help to produce distortions in Durham, N. C., New Brunswick, N. J., and Rochester, N. Y. Again, an abrupt change in the method of orienting the regular system of streets and blocks in Peoria, Ill., is a major influence in sharpening the tendency toward a diamond shape on the west and northwest sides of the central district. Variations appear in Montgomery, Ala., and Waterloo, Iowa, for the same reason.

Traffic Flow.—Richard Hurd[6] and Homer Hoyt[7] both contend that cities tend to expand outward along various axes (e.g., along certain thoroughfares that offer the best travel facilities) as well as by concentric growth around a

FIG. 3. Central business districts of six selected cities: A, Stockton, Calif.; B, Rochester, N. Y.; C, Kansas City, Mo.; D, Peoria, Ill.; E, Macon, Ga.; F, Little Rock, Ark. (Sources from which figures obtained: A, "Land Use Survey of City and Suburban Area, 1944," City Planning Commission, Stockton, Calif.; B, "Land Use Map of the City of Rochester," courtesy of the Department of Commerce, Rochester; C, "Commercial Areas Map of Kansas City, Mo.," courtesy of the Kansas CityPlan Commission; D, "Real Property Survey and Low Income Housing Area Survey, Peoria, Ill., 1939–41," W.P.A., W.P. 20221, O.P. 65-1-54-195; E, "A Graphic Presentation of the Real Property Survey of Metropolitan Macon, 1940," W.P.A., O.P. 665-34-3-45; F, "Real Property Survey and Low Income Housing Area Survey, Greater Little Rock, Arkansas, 1940," W.P.A., W.P. 5845-3.)

central point or points. Resultant linear arrangements sometimes occur even in the case of *centralized* commercial activities. This is especially true when the flow of traffic is concentrated along certain routes and commercial facilities select sites in juxtaposition for convenient location.

Unequal traffic flow may result from any number of factors—irregularities in the physical site and in the platting of streets and blocks, the peculiarities of subdivision in which jogs, discontinuities, and dead-ends appear on some streets, the improvement and widening of only certain streets leading to and from the district, the use of certain streets by public conveyances, the uneven distribution of parking facilities for private vehicles, and the irregular distribution of potential customers within both the city and the tributary area. Variations of this type produce configurational distortions of central districts in varying degrees, particularly because the time spent in travel from one place to another becomes more important than the distance involved in the travel.

In extreme cases, the center of commercial activities may not be a central point or intersection but may become elongated in one direction. For example, one thoroughfare may become dominant over all others with the result that commercial enterprises choose sites adjacent to it in linear fashion. In this instance, elongation of the district appears parallel to the thoroughfare and flattening or constriction occurs at right angles to the route. "String-town" or "shoelace" are terms commonly applied to cases of this type. The central districts of Reading, Pa., Mason City, Iowa, Lafayette, La., and Vancouver, Wash., are examples of a tendency toward single-street dominance. The districts of Sandusky, Ohio, and Savannah, Ga., represent a linear development which parallels lake and water transportation facilities. Fitchburg and Webster, Mass., have excellent representations of a combination of single-street and river dominance (the latter producing a linear commercial district in conjunction with non-nucleated manufacturing dependent on the river for water power). Centers which have developed at railway transportation stops often develop linearly (Ames, Iowa), and commercial districts in resort towns along lake and ocean fronts often develop in similar fashion to serve the needs of their customers.

Two or three routes of travel may become dominant in the cities, resulting in asymmetrical variations. As examples, Provo, Utah, and St. Petersburg, Fla., have districts which have developed almost as a "T," and the south portion of the district in Little Rock, Ark., is under the influence of two major streets which parallel each other.

Additional Distortions.—Variations in the shapes of central districts may be the result of other factors that are equally important in single instances to those already enumerated. Commercial structures vary greatly in size, particularly on the margins of the district, and such irregularities cause variations to appear when configurations are examined in detail. Trial and error methods of selecting sites for the construction of new buildings, land speculation, private desires of the individual, and the needs of the moment produce bulging in certain places and sagging in others. The outward growth of central districts as new commercial activities come into existence usually does not occur in symmetrical fashion.

Railway rights-of-way extending along one or more sides of the original nucleation may become a barrier to expansion in those directions (e.g., Macon, Ga.). Wholesale establishments, warehouses, and certain industrial activities com-

monly select sites adjacent to such rights-of-way. An interruption of the district may appear if wide strips of railway property are bridged successfully (Yakima, Wash.). In addition, parks, schools, various political structures, and other governmental uses of the land marginal to the district may block growth in one or more directions (Iowa City, Iowa, Raleigh, N. C., and Santa Fe, N. M.).

Bulges or outward extensions also may appear on one or more sides of the central district. In some cases, they appear to result from the desire of certain types of businesses to locate on one side of the district to be near other important uses of the land (state political buildings, nucleated railway or water facilities). The demand for absolute central position with respect to all activities may not be as strong as previously stated for certain types of commercial enterprises. Financial and managerial sections appear in our largest cities on one side of the central district resulting in distortions of peripheral shapes. The desire for central position for other types of enterprises may be offset by the desire to move out in the direction of the greatest number of concentrated customers (e.g., retail stores selling specialized, high cost articles to upper-income families). As long as such enterprises remain in the central district they *must* be considered as a part of centralized activities, but such developments result in bulges and sags in the shape of the district. Alterations of these types are apparent particularly in large metropolitan cities.

CONCLUSIONS

Thus it is seen that each central business district has a spatial shape which in detail appears to be unique. No specific district appears quite like any other district. In spite of the great complexity and irregularity of shapes, however, definite geometric patterns are discernable. This arises from the fact that centralized commercial activities by their very nature operate primarily under the same principle—namely, to choose central positions with respect to all internal and external activities of the city. The multiplicity of actual shapes of central districts results from local conditions which are peculiar in detail only to themselves; it is the latter conditions that produce variations from the diamond and star patterns. A geographic analysis of central business districts in various cities is best understood through a study of the various local factors which present deviations from the theoretical spatial arrangement of the central district.

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NEW ENGLAND AS A POSSIBLE LOCATION FOR AN INTEGRATED IRON AND STEEL WORKS

Walter Isard and John H. Cumberland

Dr. Isard is a Research Associate of the Harvard Economic Research Project, Harvard University. Mr. Cumberland is a Teaching Fellow and a candidate for the Ph.D. in economics at Harvard University. Both have studied problems of the iron and steel industry.

HISTORICALLY the location of iron and steel industries has been crucial in both regional political status and economic welfare. This, plus the fact that in the last century the strategy of iron and steel location has been a highly dynamic one, makes a study of the industry's spatial character both significant and timely.

Considerable speculation has centered upon the possibility of a New England location. Although in the past the various locational factors have effectively ruled out New England as a steel center, their relative strengths have altered greatly. It is relevant to inquire whether the region may now qualify as a potential location for iron and steel production. We first indicate briefly the pertinent locational factors and present some historical background.

Historical Aspects of Location

Iron and steel is primarily a transport-oriented industry. Although the costs of labor, raw materials at the source, power, and other items are significant, the differentials between possible steel producing regions with respect to these items are small compared to differentials in transport costs on raw materials and finished products which these regions incur. To be sure water, site and other conditions may be decisive when it comes to choosing the best site within a given region, but in this paper we shall emphasize general regional forces.

Historically, the major advances in modern iron and steel technology have resulted in fuel economy. When in the mid-eighteenth century about eight to ten tons of coal were required per ton of pig iron, without question the industry was oriented towards coal sites. It was more economical to move two to three tons of ore to the coal site and the pig to the market than to move coal to the ore site or to the market. As late as the middle of the nineteenth century the pull of coal sites on steel and wrought iron production was still overwhelmingly dominant. For though coal per ton of pig had been cut to two and a half tons, at least as much more was required for converting the pig to steel or wrought iron. However, during the latter half of the nineteenth century, coal lost its dominance, owing to still greater economies in the blast furnace and elsewhere. By 1939 coal requirements had fallen to one to one and a half tons per ton of finished steel. This remarkable technological achievement explains the attenuation of the pull of coal sites in steel production.

At least two other interrelated factors affected the play of locational forces. One was the increasing use of scrap as a substitute for pig iron in steel production. This has of course been partially responsible for the fall in coal requirements cited above, for less coal is required in the open hearth furnace for melting scrap than in the blast furnace for reducing ore. At the same time this increase in scrap utilization implies the use of less ore. Thus we can easily understand why ore consumed per ton of semifinished iron and steel in the United States fell nearly one-half from 1900 to 1935; from 1.83 tons to less than a ton. However, owing to large recent increases in steel production and other factors, somewhat less scrap and more ore is being used than in 1935.

The use of scrap, therefore, has greatly diminished the pull of both coal and ore sites. But the use of scrap has worked in still another direction. It has increased the attraction of a market location, especially an old established one. In the nineteenth century when relatively little scrap was used, location away from the market necessitated transporting the finished steel to the market. But now location away from the market usually entails the added transportation of scrap to the production site. When, as is often the case, the production site, e.g., Pittsburgh, does generate scrap, but not in sufficient quantity to meet all of its production needs, scrap must be imported. Location at an old established market, such as New England, thus implies a minimum of scrap transportation.

The other development to be considered is also related to fuel economies. In order to utilize blast furnace and coke

FIG. 1. Northeastern United States, showing urban centers mentioned in article as well as all principal cities.

oven gases and to avoid excessive cooling and reheating of materials, the blast furnaces, open hearths, and converters have had to be increased in size and closely integrated with rolling mills. Thus today an iron and steel market location necessitates a market large enough to absorb the output of a works of the size required to achieve most of the economies of integration.

In sum, considering the facts that (a) in 1939, approximately 1.4 tons of ore and 1.3 tons of coal were required per ton of finished steel, where Lake Superior ores were employed, (b) transport rates on finished steel are significantly higher than on ore and coal, and (c) approximately one-third of a ton of purchased scrap is required on the average per ton of finished steel, it is apparent that the strongest locational pull is that of an established market (where it is of sufficient size), even though the pull of the market is not yet completely dominant.

Present trends toward (1) beneficiation and purification of ores at the mine, permitting lower transport costs; (2) mounting accumulation of scrap in older market areas; (3) technological advances permitting fuel economies both from the use of oxygen and of enriched air in the blast furnace, open hearth, and converter and the use of high pressures; and (4) continuing development of techniques which permit the use of a greater variety of types of coal, thus tending to make coal less localized and more ubiquitous—all point to an increasing relative strength of the market pull.[1]

TRANSPORT COSTS

Let us examine New England as a potential steel producer. The region has a long established industrial market and generates considerable scrap. A location here would enjoy relatively low transport costs on finished steel in serving the local market and in transporting purchased scrap. The major competing production points will not be located close to both coal and ore, but to just one of these raw materials, or at intermediate junctions. Some will and some will not be within surplus scrap areas. Thus, none of these points, including a New England location, will exhibit a composite pull of overwhelming dominance. The problem is this: Should New England be served by a production point within the market, near coal deposits, near ore deposits, or intermediate between the three? Looking at the historical picture and trends, one is tempted to maintain that since the pull of the market seems to have grown stronger than that of either coal or ore, New England should be served by a New England producer. However, we reserve judgment until we examine in some detail vital aspects of the New England market and of steel production costs.

Table I presents, for several actual and hypothetical production points, data on transport costs on raw materials and finished product for serving Worcester, a major consuming point in New England. Sparrows Point, Buffalo, Bethlehem, Pittsburgh, and Cleveland are existing major production points best located with respect to the New England market. Fall River and New London are hypothetical production points, each of which has been proposed by its respective state as the best production point for serving New England. For a thorough analysis, we must compare the advantages at hypothetical New England points not only with those at the better located existing production points, but also with those at the better hypothetical sites outside New England. For this reason we include Trenton, a strategic transport junction with respect to the rich Venezuela ores on the one hand,

and the major eastern seaboard market on the other. The United States Steel Corporation has already announced plans to construct an integrated works of two million tons ingot capacity on a Delaware River site immediately below Trenton.

Considering the recent Labrador and Venezuela ore discoveries,[2] it does not seem unreasonable to assume that foreign ore of high quality will be available for New England. We have posited that ore for New England comes by rail and water from Labrador or Venezuela, and coal from West Virginia and east Kentucky by rail to Norfolk and water to New England.

Bearing in mind that the steel industry is transport oriented, that the major cost differentials among various sites involved in serving a given market are transport cost differentials, we see from Table I that New England locations such as Fall River and New London are best suited to serve the Worcester market (provided of course that the size of the New England market is adequate). Their transport costs on

TABLE I

TRANSPORTATION COSTS ON ORE AND COAL REQUIRED PER NET TON OF STEEL AND ON FINISHED PRODUCTS FOR SELECTED ACTUAL AND HYPOTHETICAL PRODUCING LOCATIONS SERVING WORCESTER

Location		*Transportation Costs On*			*Total*
		Ore	*Coal*	*Finished Products*	
Fall River	Labrador	$4.56	$6.01	$5.00	$15.57
	Venezuela	3.68	5.63	5.00	14.31
New London	Labrador	4.56	5.79	5.80	16.15
	Venezuela	3.68	5.42	5.80	14.90
Pittsburgh		5.55	1.56	15.00	22.11
Cleveland		3.16	3.85	15.00	22.01
Sparrows Point		4.73	4.26	11.60	20.59
Buffalo		3.16	4.27	12.40	19.83
Bethlehem		5.56	5.06	10.20	20.82
Trenton		3.68	4.65	9.60	17.93

Sources: We have based our computations upon the following requirements of coal and ore per ton finished steel: for points using Lake Superior ores, 1.42 tons of ore and 1.32 tons of coal; for points using Labrador ore, 1.36 tons of ore and 1.28 tons of coal; for points using Venezuela ore, 1.23 tons of ore and 1.20 tons of coal; and for Sparrows Point using Chile ore, 1.26 tons of ore and 1.22 tons of coal. These estimated requirements are based upon: W. A. Haven, "The Manufacture of Pig Iron in America," *Journal of the Iron and Steel Institute*, Vol. CXLI, 1940, pp. 442–46, 457–58; U. S. Bureau of Mines, *Minerals Yearbook*, 1940, p. 895; W. Isard and W. M. Capron, "The Future Locational Pattern of Iron and Steel Production in the United States," *Journal of Political Economy*, Vol. LVII, April 1949, pp. 120–22; and T. W. Lippert, "Cerro Bolivar," *Journal of Metals and Mining Engineering*, Vol. 187, February 1950, p. 132.

Iron content of Lake Superior, Labrador, Chile and Venezuela ores has been taken at 51.1, 53.4, 57.8 and 59.0 per cent respectively.

Transportation costs on finished products refer to rail movement. Those on ore and coal to actual production points refer to the existing rail-water routes employed. Those on ore and coal to hypothetical production points refer to rail-water routes as indicated below or as already indicated in text. Coal to Trenton is assumed to move by rail.

Domestic ore transportation costs are based upon figures from U. S. General Services Administration, Bureau of Federal Supply, and upon A. H. Hubbell, *Engineering and Mining Journal*, Vol. 150, April 1949, p. 87. Ore transportation costs on Labrador ores for New England are based upon our estimates of $2.00 per gross ton for the 360 mile rail haul from Knob Lake, Labrador to the deepwater port at Seven Islands and $1.75 per gross ton from Seven Islands by ship to New England. With respect to Venezuela ores, we estimate the cost of rail transport from Cerro Bolivar to Barcelona (274 miles) to be $1.35 per gross ton and the cost of water transport from Barcelona to Trenton or New London or Fall River to be $2.00 per gross ton. The transport cost on Venezuela ore ought not to be markedly different if either of the alternate rail-water routes from Cerro Bolivar to the Gulfo de Paria are developed. Ore transportation costs to Bethlehem, Pa., are based upon use of Cornwall and Lake Superior ores in the ratio of 1:3 (in rough accord with 1949 consumption). Ore transportation costs to Sparrows Point are 1939 figures for Chilean ores (U. S. Transportation Investigation and Research Board, "The Economics of Iron and Steel Transportation," Washington, 1945, Tables 26, 33 and 43). If Sparrows Point shifts to Venezuela ore, deposits of which are controlled by Bethlehem Steel, the relevant figure should be roughly comparable with Trenton's.

Coal rates are from the National Coal Association and are weighted 80–20 between high and low volatile. Rates on finished products are from the U. S. General Services Administration, Bureau of Federal Supply, and from estimates of the Freight Rate Department, New York, New Haven and Hartford Railroad.

TABLE II

TRANSPORTATION COSTS ON ORE AND COAL REQUIRED PER NET TON OF STEEL AND ON FINISHED PRODUCTS FOR SELECTED ACTUAL AND HYPOTHETICAL PRODUCING LOCATIONS SERVING

BOSTON

Location		*Transportation Costs On*			*Total*
		Ore	*Coal*	*Finished Products*	
Fall River	Labrador	$4.56	$6.01	$4.60	$15.17
	Venezuela	3.68	5.63	4.60	13.91
New London	Labrador	4.56	5.79	6.80	17.15
	Venezuela	3.68	5.42	6.80	15.90
Pittsburgh		5.55	1.56	15.20	22.31
Cleveland		3.16	3.85	15.20	22.21
Sparrows Point		4.73	4.26	12.40	21.39
Buffalo		3.16	4.27	12.60	20.03
Bethlehem		5.56	5.06	10.60	21.22
Trenton		3.68	4.65	10.40	18.73

Source: See Table I.

TABLE III

TRANSPORTATION COSTS ON ORE AND COAL REQUIRED PER NET TON OF STEEL AND ON FINISHED PRODUCTS FOR SELECTED ACTUAL AND HYPOTHETICAL PRODUCING LOCATIONS SERVING

PROVIDENCE

Location		*Transportation Costs On*			*Total*
		Ore	*Coal*	*Finished Products*	
Fall River	Labrador	$4.56	$6.01	$3.60	$14.17
	Venezuela	3.68	5.63	3.60	12.91
New London	Labrador	4.56	5.79	5.00	15.35
	Venezuela	3.68	5.42	5.00	14.10
Pittsburgh		5.55	1.56	15.20	22.31
Cleveland		3.16	3.85	15.20	22.21
Sparrows Point		4.73	4.26	12.20	21.19
Buffalo		3.16	4.27	13.40	20.83
Bethlehem		5.56	5.06	10.40	21.02
Trenton		3.68	4.65	9.60	17.93

Source: See Table I.

Venezuela ore, coal, and finished steel amount to $14.31 and $14.90 respectively, below those for Trenton and Buffalo and well below those for Pittsburgh and Cleveland. Tables II and III showing transport costs of various production points for serving Boston and Providence again testify to the transport advantages of Fall River and New London. Trenton and Buffalo offer the strongest competition.

When, however, we consider the markets of Hartford (Table IV), and especially New Haven (Table V), the transport advantages of Fall River and New London diminish noticeably. For serving New Haven, Trenton's $15.73 is well under Fall River's $17.31 and not too far above New London's $13.90. Clearly Trenton and Bethlehem have strong competitive positions with respect to the southern and western parts of the New England market. But a few qualifications are in order.

Bethlehem, as all other production points utilizing Lake Superior ores, faces rising ore costs owing to the impending depletion of higher-grade open-pit do-

TABLE IV

TRANSPORTATION COSTS ON ORE AND COAL REQUIRED PER NET TON OF STEEL AND ON FINISHED PRODUCTS FOR SELECTED ACTUAL AND HYPOTHETICAL PRODUCING LOCATIONS SERVING HARTFORD

Location	*Transportation Costs On*			*Total*
	Ore	*Coal*	*Finished Products*	
Fall River — Labrador	$4.56	$6.01	$6.80	$17.37
Fall River — Venezuela	3.68	5.63	6.80	16.11
New London — Labrador	4.56	5.79	5.00	15.35
New London — Venezuela	3.68	5.42	5.00	14.10
Pittsburgh	5.55	1.56	14.00	21.11
Cleveland	3.16	3.85	14.40	21.41
Sparrows Point	4.73	4.26	10.60	19.55
Buffalo	3.16	4.27	12.20	19.63
Bethlehem	5.56	5.06	8.60	19.22
Trenton	3.68	4.65	8.40	16.73

Source: See Table I.

TABLE V

TRANSPORTATION COSTS ON ORE AND COAL REQUIRED PER NET TON OF STEEL AND ON FINISHED PRODUCTS FOR SELECTED ACTUAL AND HYPOTHETICAL PRODUCING LOCATIONS SERVING NEW HAVEN

Location	*Transportation Costs On*			*Total*
	Ore	*Coal*	*Finished Products*	
Fall River — Labrador	$4.56	$6.01	$8.00	$18.57
Fall River — Venezuela	3.68	5.63	8.00	17.31
New London — Labrador	4.56	5.79	4.80	15.15
New London — Venezuela	3.68	5.42	4.80	13.90
Pittsburgh	5.55	1.56	13.60	20.71
Cleveland	3.16	3.85	14.40	21.41
Sparrows Point	4.73	4.26	10.20	19.19
Buffalo	3.16	4.27	12.20	19.63
Bethlehem	5.56	5.06	8.40	19.02
Trenton	3.68	4.65	7.46	15.73

Source: See Table I.

mestic ore sources. Though processes to utilize taconite and intermediate ores may prove feasible, in all probability operating costs for blast furnaces smelting Lake Superior materials will be noticeably higher.[3] In addition, taxes in Minnesota are *ad valorem* at the rate of 12 per cent whereas agreements with appropriate Canadian provincial governments indicate taxation and royalty payments at a much more modest rate. Nor is there any precedent for heavy iron ore taxation in South America.[4] Thus it seems likely that at the mine the *effective* cost (including taxes and royalties) of Labrador or Venezuela ores will be at least as low as and probably lower than the effective cost of Lake Superior ores. (We speak here of effective costs as actual costs per ton of ore adjusted for iron content as well as coke requirements for smelting. Thus our statement is not inconsistent with lower actual per ton costs for Lake Superior ores.) This then would give New England coastal points an advan-

tage over Bethlehem (as well as over other points using Lake Superior ores) not shown in the tables.

Further, part of Bethlehem's advantage is due to low transport cost on near-by Pennsylvania ores, the deposits of which are limited and could not well support expansion at Bethlehem.[5] Moreover, Bethlehem does not produce items which New England normally consumes in large quantities; and Bethlehem's production essentially is and logically ought to be oriented toward the New York City market.

Trenton, on the other hand, would not be confronted by these difficulties. In fact, should New England smelt Labrador ore, perhaps because the pattern of intercompany control of ore resources forces her to, Trenton, in smelting Venezuela ore, might have certain advantages. Venezuela ore, already estimated at well in excess of 1 billion tons, is considerably richer than Labrador ore, thought it contains considerably less manganese. In all likelihood, Venezuela ore will require less coke for smelting and be more easily mined owing to more clement climatic conditions. Only a season of six to seven months of open-pit mining can reasonably be expected at Labrador, and the water shipping season will be much shorter than the ten months during which the port of Seven Islands is ice-free.[6] Thus the effective costs of Venezuela ore may be lower than Labrador ore. In addition there would result a decrease in New London's transport cost advantage over Trenton and an increase of Trenton's advantage over Fall River in serving New Haven and more southerly points. In short, the competitive position of Trenton in the lower and western New England market would undoubtedly be strong.

We have used rail rates in computing costs of transport on finished products. The picture is changed only slightly when we consider highway and water movement. Comparative rail and motor carrier rates are presented in Table VI. Motor carrier rates tend, though irregularly so, to be somewhat below rail rates. But only with respect to the Boston, Providence, and Worcester markets does highway transport offer a greater saving for actual and potential non-New England production points than for potential New England production points.

Owing to expensive port and handling charges, water shipments of steel along

TABLE VI

COMPARATIVE RAIL AND MOTOR CARRIER RATES, CENTS PER 100 LBS.[a]

FROM:	*Fall River*		*New London*		*Trenton*		*Sparrows Point*		*Bethlehem*		*Buffalo*	
	Rail	*Highway*	*Rail*	*Highway*	*Rail*	*Highway*	*Rail*	*Highway*	*Rail*	*Highway*	*Rail*	*Highway*
TO:												
Boston	23	23	34	33	52	48	62	84	53	50	63	85
Worcester	25	24	29	28	48	45	58	57	51	48	62	57
Providence	18	19	25	25	48	46	61	57	52	48	67	85
Hartford	34	33	25	22	42	39	53	52	43	42	61	55
New Haven	40	39	24	23	37	36	51	50	42	39	61	57
New York	52	53	44	42	24[c]	28[b]	42	44[b]	29	32[b]	58	55[b]

Sources: Correspondence with U. S. General Services Administration, Bureau of Federal Supply; New York, New Haven and Hartford Railroad Co., Freight Traffic Department; Middle Atlantic States Motor Carrier Conference, Inc.; and The New England Motor Rate Bureau, Inc.

[a] Motor carrier rates from New England points are for a minimum of 20,000 lbs.; and from other points, 23,000 lbs. Rail rates are for a minimum of 40,000 lbs.

[b] New York, Zone 1.

[c] Harlem River.

the New England coast are relatively negligible. For example, in 1939 coastwise receipts at the Port of Boston amounted to 11,230 tons of iron or steel plates and goods and, in 1947, to 8,803 tons of an approximately comparable category.[7] When we recognize that (1) one of the best points in New England to serve by coastal water shipments should be the Boston area because it is farther from Sparrows Point than any other major New England consumption point upon the seaboard, and (2) according to the *Iron Age* study, consumption of the Boston area comprises one-fifth of New England's, it does not seem that any major domestic movement of steel by water along the New England and Middle Atlantic coasts is to be expected in the near future.

OTHER COSTS

Though differentials among regions with respect to other cost items are usually unimportant, except for scrap, nonetheless it is helpful to touch upon them briefly. The supplies of limestone for a New England steel operation seem to be ample and excellent in quality. For example a broad belt of limestone extends from Vermont through western Massachusetts down into northwestern Connecticut, with a number of deposits in excess of 95 per cent, and reaching as high as 98 per cent, purity.[8] Though deposits are not immediately adjacent to New London and Fall River, this should not impose a major disadvantage.

In regard to coal prices at the mine, a factor which was not considered in the computation of our tables, differentials are minor. The National Coal Association reports a maximum spread of 15 cents per net ton between mine prices of coal in West Virginia and Pennsylvania for low volatile coal and 25 cents for high volatile.

Although labor costs form a high percentage of total costs in iron and steel, labor cost differentials among firms and regions can be ignored as a locational influence. The industry is highly unionized; and the Labor Department has largely accepted union wage scales in setting the minimum wage scale which a company must observe to qualify to sell steel to the government under the Walsh-Healy Public Contracts Act. For example, a laborer in the lowest job classification is paid $1.18½ per hour by all major firms, except in the South, where a differential of 14½c. per hour exists which equalizes effectively the efficiency wages of Southern and other workers.[9]

With respect to land and related factors, our three hypothetical sites are reported to possess appropriate geological substructures, sufficient flat terrain, and adequate potable and industrial water. Existing state and Army engineering plans call for the deepening and improvement of the relevant water channels of these sites, which would permit the development of extensive waterfront facilities. New England's disadvantage for the generation of power and the procurement of fuel oil is already embodied in our assumptions concerning the utilization of coking-oven and blast furnace gases, and in the data in our tables on coal consumption and transport costs.

Taxes are a critical element. Rates vary considerably from state to state as well as from locality to locality within a state. In addition assessments are notoriously arbitrary and without doubt concessions will be offered by various local and state authorities. As of fiscal 1948 local property tax rates were 35 mills for Freetown (Fall River), 35 mills for New London and around a minimum of 30 mills for Bucks County, Pa. (Trenton). Corporate income taxes

amounted to roughly 6 per cent for Massachusetts, 3 per cent for Connecticut, and 4 per cent for Pennsylvania which also levied capital stock and franchise taxes of 5 mills.[10] Perusal of these figures, however, gives little insight into what total tax burden might actually be. In light of the factors cited as well as numerous others, any estimate of relative tax burdens must be considered little more than speculation at this point.

SCRAP PRICES

A vital consideration we cannot ignore is scrap costs. However, the derivation of transport costs on scrap is a complex matter. Unlike other steel raw materials, whose sources may be considered as geographical points for location analysis, scrap is supplied from a large area. The scrap going into a ton of steel may come from several different points at different rates. Thus we have to rely upon analyses of scrap prices. Because of their sensitivity to changing geographic supplies and demands for scrap, the market prices for scrap at various points reflect not only scrap resources of immediately surrounding areas, but also costs of transportation from surplus areas.

As of March 2, 1950, the price of number 1 heavy melting scrap at Boston was $10.50 to $11.00 below that at Pittsburgh (see Table VII) and considerably lower than the price paid at the major producing points currently supplying New England. Assuming the use of one-third ton of scrap per ton of steel, this would *a priori* imply an advantage of roughly $3.50 for a Boston producing point over Pittsburgh. But this reasoning is fallacious. It is true: (1) that recently around a million tons of scrap has been originating annually in New England on Class I Steam Railways while less than 30 per cent has been terminating;[11] (2) that an integrated works producing a million tons of ingots annually would require roughly 250,000 tons of purchased scrap; and (3) that as scrap prices rise new sources are tapped which tend to become permanent. But any potential production point in New England would not be able to supply its needs from its immediate environs. It would have to import from other points thus incurring the relatively high handling costs on scrap. This might leave a New England production point with a scrap price advantage over points like Pittsburgh of, say, $1.00 per ton of steel, and with some small advantage over interior points like Buffalo and Cleveland (see Table VII). It seems likely that a scrap price advantage over Sparrows

TABLE VII

PRICES OF NUMBER 1 HEAVY MELTING SCRAP

(Per Gross Ton)

	July 4, 1949	*November 14, 1949*	*March 2, 1950*
Pittsburgh	$21.00	$29.00–$30.00	$31.00
Cleveland	14.50–$15.50	30.00–30.50	28.00–$28.50
Philadelphia	18.00	25.00	23.50
Detroit	14.50–15.00	21.00–22.00[a]	21.00–22.00[a]
Buffalo	19.00–19.50	28.00–28.50	28.00–28.50
New York	12.50–13.00[a]	21.00–22.00[a]	20.50–21.00[a]
Boston	13.00–13.50[a]	20.00–20.50[a]	20.00–20.50[a]
Birmingham	18.00	25.00	24.00

Source: *Steel*, Vol. 125, July 4, 1949, p. 132; Nov. 14, 1949, p. 144; Vol. 126, March 6, 1950, p. 150.

[a] Broker's buying price, F.O.B. shipping points.

[b] F.O.B. shipping points.

Point or Trenton, also within the eastern seaboard surplus area, would at best be slight.

MARKET

Granted a favorable supply of ore and proximity to local consumers, definite transport cost advantages today appear to favor serving New England steel consumers from a New England mill. This merely reflects the historically increasing strength of the market pull. However, not only supply (cost), but also demand (market) conditions must be considered. To realize maximum economies of integrated large-scale blast furnace, coke oven, open hearth and rolling mill operation, a market must be able to absorb the output of a full-scale specialized works. How nearly can New England?

The latest and most complete information on New England consumption of steel products is found in a 1948

TABLE VIII

NEW ENGLAND CONSUMPTION OF STEEL, PRODUCTION OF STEEL, AND CONSUMPTION OF NON-NEW ENGLAND STEEL (IN NET TONS), 1947[a]

	Bars and Shapes	*Sheet and Strip*	*Structural Shapes*	*Plates*	*Wire-rod*	*Rails and Related Items*	*Other Carbon Steel*	*Alloy Steel*	*Stainless Steel*	*Total*
1. Consumption by metal fabricating and producing establishments; (Census estimates)[b]	273,175	494,171	74,509	99,594	.....	.....	140,447	136,940	12,316	1,231,152
2. Consumption of wire rods by New England wire drawing plants	.....	.....	.....	.....	364,699	.....	.....	.....	.....	364,699
3. Consumption by construction and contractors' product industries	59,279	111,271	107,214	89,175	899	1,151	61,536	*	*	430,525
4. Consumption by New England railroads	15,954	15,606	21,794	34,903	.....	89,115	5,136	*	*	182,508
5. Consumption by agricultural, mining, quarrying and lumbering industries	11,560	7,936	1,144	2,135	117	422	2,164	*	*	25,478
6. Total Consumption	359,968	628,984	204,661	225,807	365,715	90,688	209,283	136,940	12,316	2,234,362
Less New England Production	.....	153,000	.....	.....	221,850	.....	.....	.....	.....	374,850
Total Consumption of Non-New England Steel	359,968	475,984	204,661	225,807	143,865	90,688	209,283	136,940	12,316	1,859,512
U. S. Exports	695,033	488,286	416,694	1,110,862	39,050	1,057,482	399,213	*	*	4,206,692

*Included with carbon steel products.

[a] The figures on consumption and production of the various steel products are calculated on a basis that avoids duplication. No item appearing in one column appears again in a second column as a more finished product.

[b] The estimates of the *Iron Age Study*, though considerably higher for New England, are not used here. They are based upon a sample from plants employing approximately one-third of the total workers in the metal working industry whereas the Census figures are derived from an actual canvass of all plants. The Census reports consumption for New England as 1.48 million tons and for the U. S. as 43.15 million tons in 1947. *Iron Age* totals for 1948 are 2.78 million tons and 45.95 million tons respectively. The U. S. totals are fairly close (a difference of 6%). Since total steel production was 84.89 million tons for 1947 and 88.64 million tons in 1948 (a difference of 4%), the *Iron Age* total for the U. S. is acceptable. However, the discrepancy between the New England figures for the two years is 49% of the larger figure. This is too great to be attributed to different rates of production in two years. It reveals that New England's consumption pattern is sufficiently divergent from that of the rest of the country to throw doubt upon the consumption estimates derived from sampling. The source of error probably lies in the fact that in estimating totals from samples, the assumption was made that consumption is proportionate to number of workers employed, whereas New England employment per ton is higher than in the rest of the country because of the specialized forms produced.

study by *Iron Age*[12] and in the 1947 *Census of Manufactures*.[13] The more conservative and much more reliable census data are used here, in conjunction with our estimates on items not covered by the census. In Table VIII we have set down in the first row the census figures on consumption of bars and shapes, sheet and strip, structural shapes, plates, other carbon steel, alloy steel, and stainless steel by New England's metal fabricating and producing establishments. The census figure on drawn-wire consumption is not used. New England's production of drawn wire exceeds her consumption. If we used the drawn-wire consumption figure, we would understate New England's consumption of wire-rods which is the pertinent factor in estimating market potential for the output of a New England steel works. We have estimated New England's wire-rod consumption in 1947 at 364,699 tons. This is based on the assumptions that 90 per cent of New England's capacity for wire drawing was utilized in 1947 and that a weight-loss of 5 per cent is incurred in drawing wire.

The census does not provide data on consumption of non-manufacturing industries—such as construction, rail transportation, agriculture, mining and lumbering. Crude estimates of the steel consumed by each of these industries in New England were arrived at by multiplying steel consumed nationally by these industries in 1947[14] by the following percentage figures: for construction, by New England's percentage share of new construction in 1947 (5.07);[15] for rail transport, by the percentage of total United States freight and passenger revenue of Class I railways earned by New England railways (3.74);[16] for agriculture, by New England's percentage of total United States agricultural income payments (1.95);[17] and for mining, quarrying, and lumbering, by the percentage of recorded United States taxable payrolls in these activities originating in New England (0.42).[18]

From our total consumption figures in Table VIII, we must subtract New England production to arrive at an estimate of total consumption of non-New England steel, which *a priori* might be considered the potential market for a new steel works in New England. As of January 1, 1948, New England possessed ingot capacity for producing 170,000 tons of hot rolled strip and for producing 246,500 tons of wire-rod, assuming a weight-loss of 15 per cent from the ingot to the wire-rod.[19] If we posit that New England facilities were operating at 90 per cent of capacity in 1947, we obtain the figures of 153,000 and 221,850 respectively. New England had no ingot capacity for producing the other steel items listed in Table VIII.

However, the interpretation of the figures on total consumption of non-New England steel as a potential market for a New England steel plant requires several serious qualifications. First, there is no way to account for what may be New England's slice of the export market. Nor is there any basis for estimating what the size of the export market may be in future years. The nature of the export market by product for 1947 is indicated in Table VIII. Although we do not relate any part of the export market (which is largely served from Atlantic seaboard points) to possible New England production, the reader may wish to do so. Columns 1 and 2 of Table I indicate that the comparative cost position for a New London or a Fall River location for such markets is not decidedly favorable, especially if Sparrows Point does come to utilize Venezuela ore. As regards other markets in the United States

which can be reached by water shipment —for example, Florida and the Gulf Coast—again New England sites may not be able to compete easily with more southerly points on the Atlantic seaboard. Another very uncertain element in the picture is shipbuilding demand. New England has excellent shipbuilding facilities. If a military program calls for constant replacement of obsolete warships, New England's demand for steel in the future, especially for plates, may be considerably increased.

Second, it is very probable that the New England demand for rails and related products, for alloy and stainless steel, and for each of the diverse products listed in other carbon steel, will be insufficient to warrant the specialized, but large-scale, facilities required in their production. We should restrict our attention to New England's demand for the five categories in the first five columns of Table VIII. The total of New England's consumption of non-New England bars and shapes, sheet and strip, structural shapes, plates, and wire-rod amounts to 1,410,285 tons. This would seem more than enough to absorb the output of an integrated works with a capacity of 1¼ million tons of ingot. However, we must compare the capacity of efficient rolling mills designed to produce the range of products used in New England in each of these five categories with the 1947 New England consumption in each of these five categories. Recent modern sheet and strip mills versatile enough for New England have annual capacities of from 600,000 to 800,000 tons,[20] whereas the comparable figure in Table VIII is 475,984 tons. Modern efficient plate mills range in capacity from 250,000 to 300,000 tons;[21] the figure in Table VIII is 225,807. Information seems to indicate that a structural mill large enough to meet New England's range of demand would have a capacity of from 300,000 to 720,000 tons,[22] which figure contrasts with estimated New England imports of a little over 200,000 tons in 1947. An efficient bar mill can be as small as 270,000 tons;[23] the relevant figure in Table VIII is 359,968 tons. Rod mills become economical at a capacity of from 150,000 to 250,000 tons;[24] in 1947 New England's net imports are estimated at 143,865 tons. Thus, from these comparisons, it is clear that the total of these first five categories must be used with considerable circumspection. A more detailed study of specific steel items consumed by various industries in terms of the input-output and other techniques is required.[25]

Third, and perhaps most important of all, a tidewater location southwest of New York City possesses tremendous advantages. A works at such a location threatens to pre-empt a large part of the southern New England market and perhaps some of the western New England market. We have already commented upon Trenton's strength for serving New Haven. This would be still greater for serving the large consuming points such as Bridgeport and Norwalk south of New Haven. It should be borne in mind that the *Iron Age* study estimates that the Bridgeport-New Haven-Waterbury area accounts for roughly one-fifth of New England's steel consumption (578,807 tons out of an over-estimated total of 2,870,278).

Also it has been intimated that a New England plant could serve the huge New York City market.[26] Perusal of Table IX casts serious doubt upon this hypothesis. Trenton reaches New York City at a total transport cost of $13.13 per ton; Bethlehem, at $16.42; Sparrows Point, at $17.39; whilst Fall River and New London reach New York City at the relatively high total transport costs of $19.71 and $17.90 respec-

TABLE IX

TRANSPORTATION COSTS ON ORE AND COAL REQUIRED PER NET TON OF STEEL AND ON FINISHED PRODUCTS FOR SELECTED ACTUAL AND HYPOTHETICAL PRODUCING LOCATIONS SERVING NEW YORK

Location		Transportation Costs On			Total
		Ore	Coal	Finished Products	
Fall River	Labrador	$4.56	$6.01	$10.40	$20.97
	Venezuela	3.68	5.63	10.40	19.71
New London	Labrador	4.56	5.79	8.80	19.15
	Venezuela	3.68	5.42	8.80	17.90
Pittsburgh		5.55	1.56	12.40	19.51
Cleveland		3.16	3.85	14.00	21.01
Sparrows Point		4.73	4.26	8.40	17.39
Buffalo		3.16	4.27	11.60	19.03
Bethlehem		5.56	5.06	5.80	16.42
Trenton		3.68	4.65	4.80	13.13

Source: See Table I.

tively. However, it is important to remember that iron and steel producers frequently invade each other's markets (especially during depressions as long as they can cover out-of-pocket costs). We should expect New England's market to be invaded by outsiders even if there did exist a New England plant with definite cost advantages. But then we should expect the New England producer to invade other markets, and the New York City market would be an excellent one to penetrate without incurring high transport costs.

Fourth, the iron and steel industry attaches to itself an agglomeration of other production activities. Arguing from historical experience in the Sparrows Point-Baltimore-Philadelphia area, Neal has estimated that from 1947–1960 a reasonable maximum increase in New England's consumption of carbon-steel sheets, strip, plates, and bars and silicon-steel sheets might be 546,000 tons.[27] This figure, of course, includes normal growth. However, such an estimate based upon past experience in a different region necessarily cannot have much substance. Aside from pursuing detailed location studies of possible ancillary industries and carrying out the extensive computations involved in an input-output analysis, there is no tenable basis for anticipating how much and what kind of agglomeration might ensue.

In sum, the total figures of Table VIII look impressive and we can expect continuous growth and agglomeration. Nonetheless, with the strong possibility of Trenton sharing the southern New England market, we do not have, given the gross classification of products employed by the census and our rough computations, an adequate basis for stating whether or not the market situation is favorable.

OTHER CRITICAL FACTORS

In addition to the forces already discussed, several others may prove to be strategic. Both Fall River and New London are contacted directly on only one major railroad. They cannot offer the keen competition among railroads on the basis of services provided which in the past has often been a major consideration in a location decision. The potential threat that United States Steel may develop Trenton as a major steel site and that Bethlehem Steel may expand facilities at Sparrows Point, Bethlehem, Pa., and Buffalo, N. Y., may also

operate as a deterrent to sinking a huge investment in a New England plant. Moreover, some believe that many segments of the steel industry lack the type of vigorous entrepreneurship responsive to a dynamic situation. However, alternative pricing policies ought not to affect the feasibility of a New England mill. Neither a basing point nor an f.o.b. mill pricing policy influences long-run costs in serving any given market, which is the crucial matter.[28]

One final consideration may prove critical for the immediate future. Construction costs of steel plants have risen precipitously since World War II. It has been estimated that, on the average, construction costs for steel capacity have risen some 95 per cent from 1939 to 1949.[29] Some steel spokesmen maintain that until steel prices are brought into line with construction costs, development of new locations as an alternative to reinvestment in existing facilities is not feasible. However, should this be true in the short-run, in the longer run worn-out facilities must be entirely replaced even at higher construction costs. This implies that if prices are out of line with construction costs today, they will have to be adjusted in the long-run. In any event exploitation of the Labrador and Venezuela ore deposits requires time. Construction of plants predicated upon their use cannot be expected for a few years. Moreover, it is very likely that the transport savings of new Atlantic tidewater locations in serving the Eastern seaboard can permit profitable operation despite depreciation charges on a higher initial investment.

CONCLUSION

In conclusion, a New England operation based on Labrador or Venezuela ores would enjoy definite transport cost savings over existing operations in serving the New England market. However, the advantage over the potential site of Trenton disappears as one approaches the southern New England area. Other costs of production are not unfavorable for New England, and there may be some slight advantage as regards the price of scrap.

The size of New England's steel market has been estimated by utilizing the gross census categories of semi-finished steel products and by employing crude methods for including steel consumption by industrial sectors not covered by the census. The total of non-New England steel consumed in New England *per se* seems sufficient to support an integrated works with a capacity of 1¼ million tons of ingot. However, a large number of specialized items comprise this total, many of which, because of limited New England demand, could not be profitably produced in New England. As a consequence, New England's market potential may be somewhat larger than necessary, or may be not quite large enough. In this more or less marginal market situation, (1) much more information on the consumption of specific steel items by specific industries is needed, and (2) more use of input-output and other techniques to estimate growth and agglomeration is required before one can judge whether or not a New England integrated steel works is feasible.

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THE PORT OF SOUTHAMPTON

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SOUTHAMPTON is the third largest port in Great Britain and is entering on a new phase of expansion and economic development. The growth of the modern port dates from the year 1836 when the Southampton Dock Company was incorporated. During the preceding 600 years the general layout of the dock area remained much the same as in 1204 when the removal of the Royal house from Winchester to London marked the close of an earlier phase of prosperity.

The advantages of Southampton as a port site were brought into effective demand in the middle of the nineteenth century as technical improvements in railroad and steamship transport, and economic changes within the country and overseas, encouraged a southward trend in the settlement of population and industry.

Southampton Water leads from the English Channel entrances to the vital highways of southern England—by way of Winchester and a water gap at Basingstoke to the London Basin, northwards to the Midland plains, and westwards to the Bristol area. More than one-third of the population of Great Britain lives within a 100-mile radius of the docks; and railroads, and, more recently, a road network, converge on the port.

The port is linked with the English Channel by a deep protected waterway; and vessels sailing between England and the neighboring coasts of France or the more distant ports of North and South America, or Africa or the Far East, can sail up this easy and obvious approach to within 75 miles of London. Furthermore, Southampton can function as a convenient transit port for passengers and cargo between north-central Europe and the Atlantic. For similar reasons the port has become the principal Marine Air Base of Great Britain.

Geographical Setting

South Central England consists of a broad shallow basin—the Hampshire Basin—filled with gravels, sands, and clays, and surrounded by low chalk downlands. The rim of chalk downland is breached by the sea along the coast of the English Channel. Accordingly, much of the lower part of the basin has been inundated and the sea penetrates to the heart of the basin by way of Southampton Water where two converging rivers, the Itchen and the Test, meet to form the port site.

In common with much of Northern Europe, Southern England was covered to a considerable depth by the Cretaceous Sea. The chalk beds which accumulated on the floor of this ocean were raised very slowly and irregularly until considerable areas became exposed above sea level. Large rivers drained these exposed portions of the chalk; and

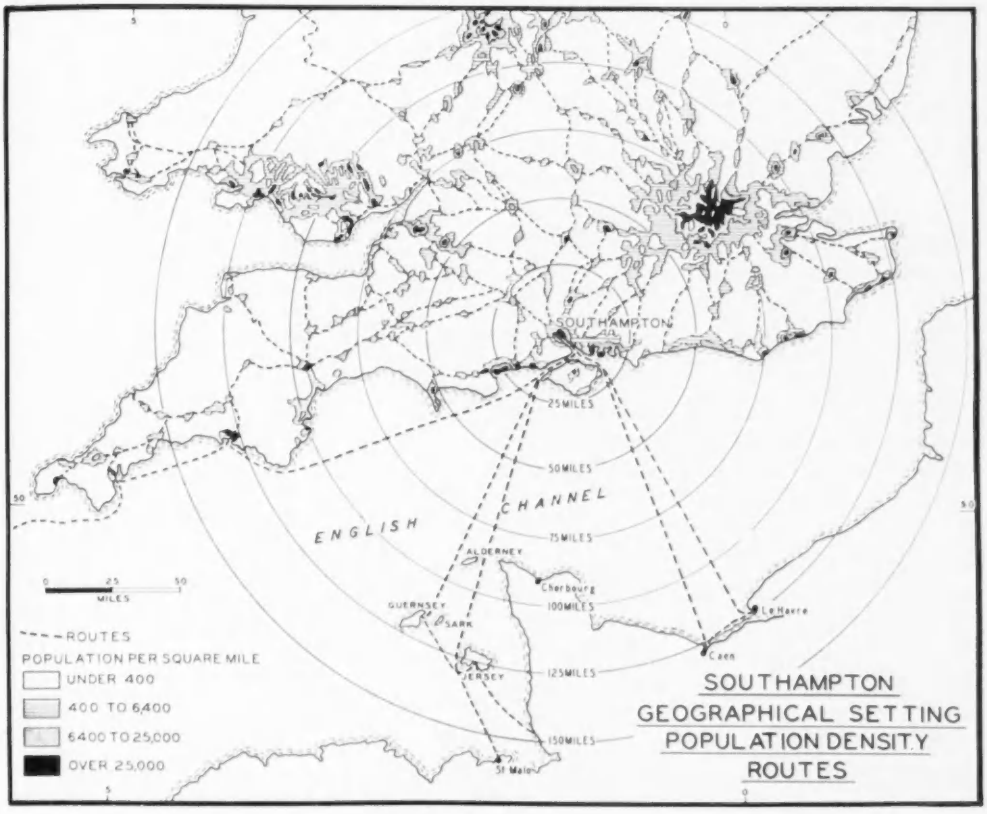


FIG. 1. Southampton is strategically located on the south coast of England.

eroded material, such as pebbles, gravels, sands, clays, and ooze, was carried down and deposited in broad and shallow troughs that remained submerged beneath the sea. In due course, more recent earth movements raised these shallow basins above sea level and exposed the latest (Eocene or Tertiary) deposits.

Thus the Hampshire Basin is shaped somewhat like a saucer having an outer rim of chalk downland about 1000 feet above sea level. Towards the center of the basin, where the chalk sinks 400 feet below sea level, there is a covering of Tertiary gravels, sands, and clays.

The basin is drained by three main river systems: the Avon in the west, and the Test and the Itchen in the center. The watershed formed by the rim of chalk downland is one of the most significant in Southern England: it separates those rivers which flow southward towards the English Channel, and which have their counterpart in the rivers of the Paris Basin, from those which flow towards the London Basin and the North Sea and have their counterpart in the rivers of the Rhine area.

There is evidence that the Test and the Itchen flowed, at one time, in independent courses towards the sea. Slight changes of level have caused the lower Test to flow somewhat to the east of its original channel and to join the Itchen; so that the two rivers now flow together in a submerged estuary

down Southampton Water to the Solent and the English Channel.

The changes in the level of the land which altered the course of the Test brought about considerable adjustments of the coastline of southern England. Before the partial submergence of the central part of the Hampshire Basin, the Isle of Wight was joined to the mainland and the coastline lay several miles to the south of its present position. The rivers which drained the basin formed part of one major system—often referred to as the Solent River—whose estuary opened out into the English Channel many miles to the eastwards. The subsidence of the south central part of the basin, which may have been a gradual process, resulted eventually in the breaching by the sea of a narrow gap at the Needles into the Solent River by which the Isle of Wight was separated from the mainland.

APPROACHES TO THE PORT

As soon as the gap was breached, the sea inundated the lower part of the old Solent River and a protected tidal waterway, 15 miles in length, connected the junction of the Test and Itchen Rivers with the English Channel; not only eastwards by the wider channel of Solent-via-Spithead, but also through the new breach to the westwards.

The older, eastward approach—Solent-via-Spithead—has a deeper channel and is more used than the western approach. The eastern approach is 7 to 9 fathoms (14–18 meters) deep for 2½ miles; the channel then deepens to 10 fathoms (20 meters) and continues through the Solent to the western approach where there is a depth of about 5 to 8 fathoms (10–16 meters). The entrance to the western approach is impeded by a large bank of shingle piled up by the flood tide and gales,

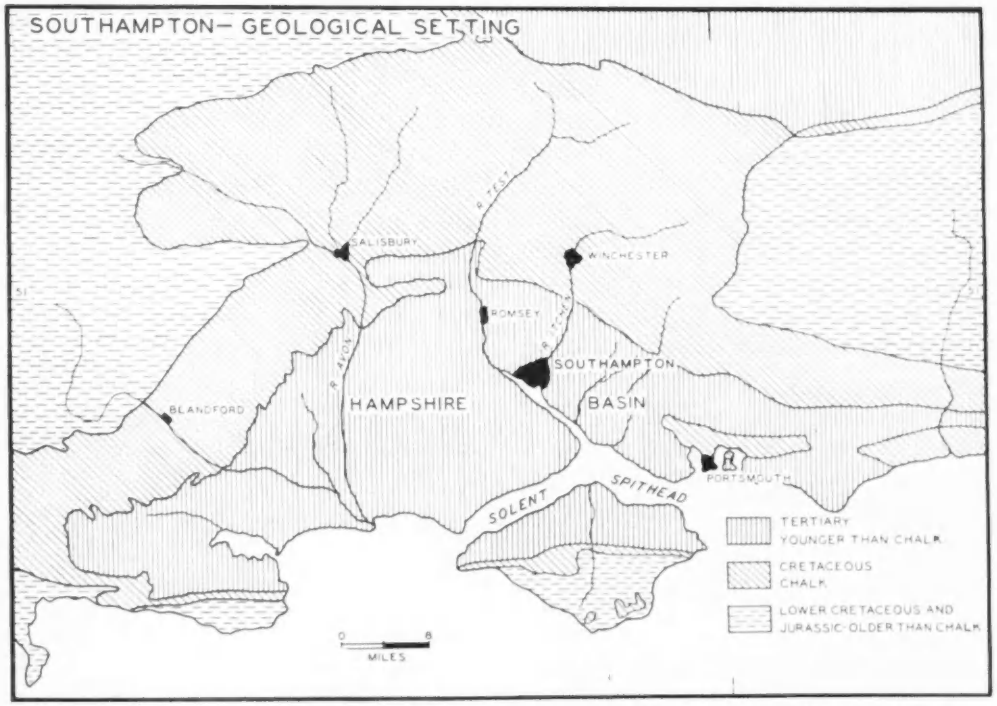


FIG. 2. Southampton is located near the center of a topographic and structural basin. The estuary is protected from the English Channel by the Isle of Wight. The eastern approach to the estuary is more commonly used than the western. (After Geological Survey of Great Britain.)

though the rush of water through the gap maintains a free channel. However, all the larger class vessels wishing to use the port prefer to enter Southampton Water by way of Spithead at the eastern end of the Isle of Wight. In the case of vessels coming from the Atlantic, this detour lengthens the journey to the port by 30 miles.

Southampton Water extends inland six to seven miles from the Solent to the dock area. The width of the estuary is about one mile at high tide and half a mile at low tide. Almost complete protection from storm influences is assured, since the prevailing south-westerly winds blow at right angles across the line of direction of the estuary and the Isle of Wight protects the Solent approaches and Southampton Water from the heavy seas of the English Channel.

The shipping channel follows approximately the line of natural drainage. A natural channel runs from the junction of the Test and the Itchen Rivers to the Solent and this channel has been widened and deepened to obtain a minimum depth of 35 feet (12 meters) at low water from the docks to the sea over a width of at least 1000 feet in the lower reaches and 600 feet or more in the upper reaches.

Dredging problems have been reduced to a minimum. The amount of silt deposited by the two rivers, Itchen and Test, is small in relation to the drainage area, since the rivers drain chalklands in their upper courses and flow through considerable flood plains before reaching the estuary. Moreover, the channel runs approximately in line with the strongest tidal streams and thus the deep channel is kept reasonably free of silt by the normal tidal scour.

The main disadvantage in following the natural channel is that vessels using the eastern approach must negotiate two difficult turns—one at Bramble Bank and the other off Calshot Spit. Dredging of the channel includes the improvement and straightening of the shipping lane at these turns. An alternative channel—North Channel—could be cut to avoid the bends, but the initial outlay and costly maintenance of a channel athwart the currents is an uneconomic proposition at the present time.

TIDAL PHENOMENA

In addition to the deep natural channel, which enables vessels of the largest class to berth at the docks, Southampton Water has the further advantages of two unusual tidal phenomena which are invaluable in the manoeuvring of shipping, particularly large liners. Southampton Water, in common with much of the coasts of southern England and the opposite coasts of France, experiences a second high tide about two hours after the first. There is a slight ebb between the two high waters but the practical effect is to produce a prolonged high water lasting about three hours. As the phenomena is not confined to Southampton Water the cause cannot be attributed solely to the position of the Isle of Wight, by which part of the tide reaches Southampton Water by way of the western approach and the second high water follows round by way of the eastern approach. Two explanations have been put forward. The first is the effect on the Atlantic Tidal Wave of the Cotentin peninsula which projects northwards into the English Channel from the coast of France. It is suggested that part of the great tidal flow of water entering the English Channel from the Atlantic is held back by this peninsula with the result that the tide is divided into two parts—the main flow, which passes directly up the English Channel, and a delayed flow which

has been checked by the peninsula. This explanation would account for the phenomena being observed along the English coast eastwards of Weymouth, and along the coast of France eastwards of Honfleur and Le Havre.

The alternative explanation, which receives more support, is that parts of two successive Atlantic Tidal Waves meet in the vicinity of St. Malo. From Lands End, part of one of these tidal waves, derived from the immediately preceding transit of the moon, passes directly up the English Channel and causes the "first high water." Part of another tidal wave—derived from the transit of the moon immediately preceding the transit already mentioned—flows northwards from Lands End, rounds the north coast of Great Britain, travels southwards along the east coast, and eventually passes westwards into the English Channel at the Straits of Dover thus causing the "second high water." By this explanation the first high water of one tide and the second high water of the next tide are derived from the same tidal wave, with an interval of 14 hours 20 minutes.

There are, however, difficulties which make this explanation untenable; and the most recent theory suggests that, as the cotidal lines of the English Channel radiate from a degenerate amphidromic point located to the N.W. of the Isle of Wight, then the whole of Southampton Water lies near a nodal line or amphidromic point where double low waters and high waters naturally occur.[1]

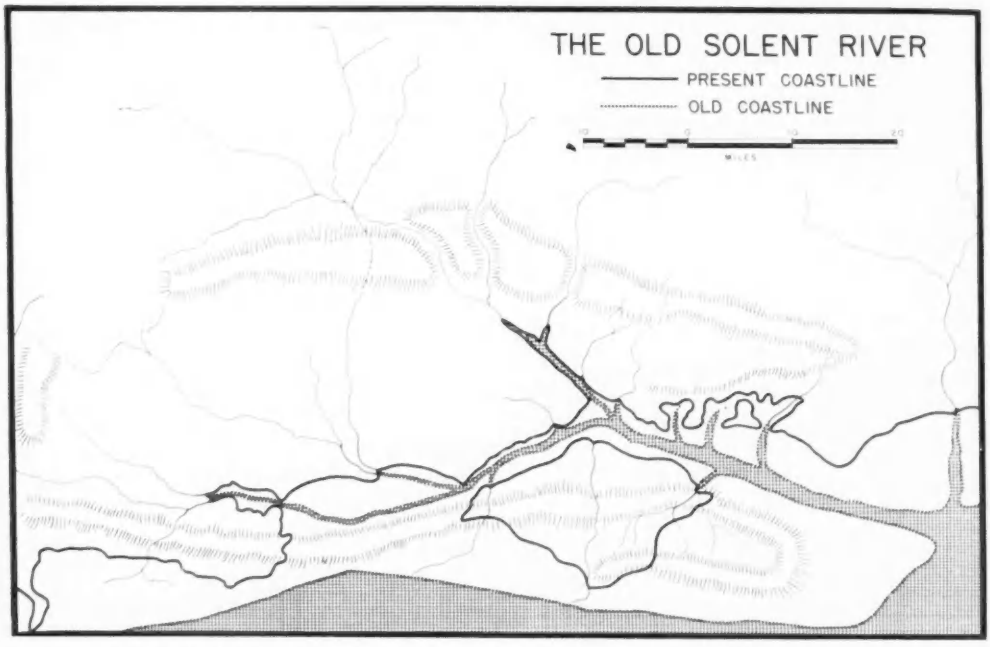


FIG. 3. The Old Solent River in relation to the old and present coastlines. Subsidence resulted in detachment of the Isle of Wight from the mainland. (After Cole, *et al.*)

In addition to the double high water there is a period of slack during the flow lasting from one to two hours and sometimes longer. This break in the flow occurs on every tide when there is between five or six feet of water above datum, and is most useful for ships

[1] Lt. Comdr. D. H. MacMillan, "Tidal Features of Southampton Water."

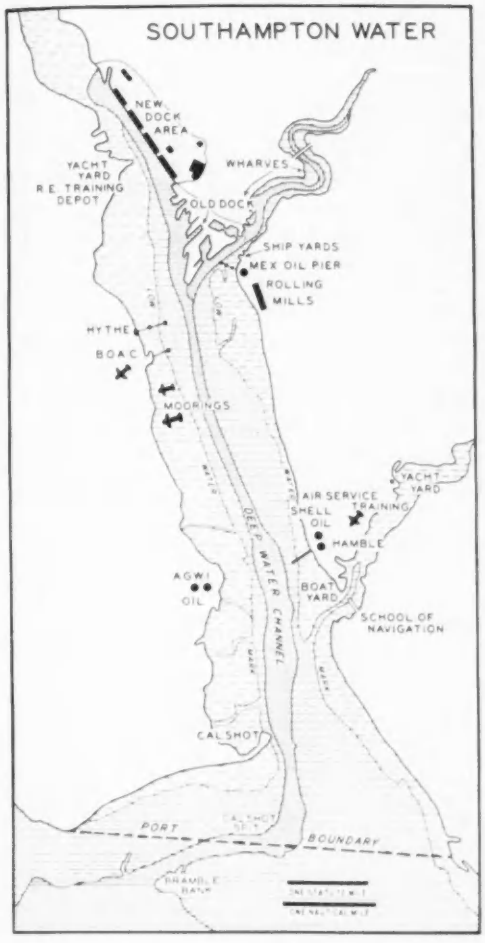


FIG. 4. Southampton Water extends inland six to seven miles from the Solent to the dock area.

shifting berth or using the dry docks or for other work when the avoidance of tidal currents is desirable.

HISTORY OF THE PORT

Archeological evidence shows that the port was used at an early date by traders from France. There are indications also of Celtic civilization and of commerce with Phoenecian and Greek merchants, but it seems unlikely that the seaport was used extensively till after the conquest of Britain by the Romans.

Julius Caesar led expeditions across the English Channel to Kent in 55 and 54 B.C.; and about 100 years later in 43 A.D. a serious attempt was made to incorporate the islands within the Roman Empire. In this second invasion of Britain, led by Vespasian under the Emperor Claudius, Hampshire was reduced. Traces of early Roman settlements remain at Bitterne Manor, where the Itchen River winds round an easily defended peninsula to form the site of the Old Roman station of Clausentum. Clausentum was an important outpost of the central Roman station at Winchester 12 miles higher up the river.

The name Southampton seems to date from this period, and was derived either from a Roman—Laelius Hamo—who was assassinated in the district (hence Hamo's town or Hampton), or, more likely, from the name of the River Antona as Southampton Water was called by the Romans.

The rise of the port followed the Norman Conquest several hundred years after the Roman conquest, when Continental traders recognized the advantage of Hamptun (Southampton) as a center for the trade they hoped to establish with England. The Royal residence was located at Winchester and for about 150 years much traffic passed through Southampton between the English Kingdom and Normandy. Trade consisted mainly in imports of wine; and the older parts of the town are honeycombed to this day with wine cellars in excellent preservation and usable.

Passenger traffic was probably more important than cargo, as there was constant arrival and departure of kings, noblemen, statesmen, soldiers, priests, and traders.

With the loss of Normandy (A.D. 1204) and the other provinces in Northern France, the royal house left Winchester, and Southampton ceased to function as the vital outport of a royal city. The

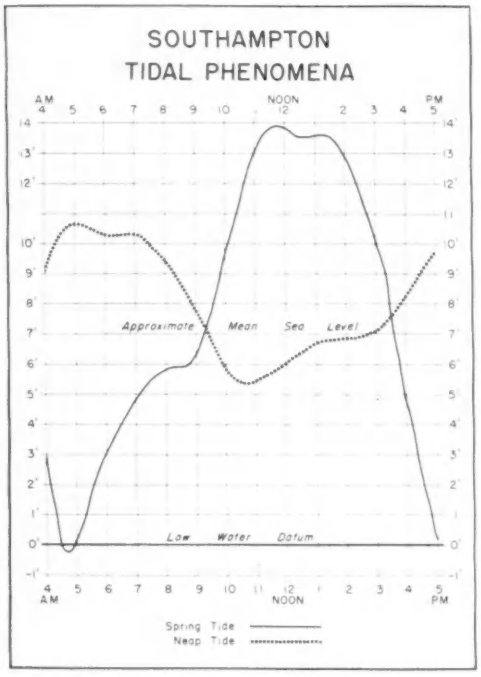


FIG. 5. Southampton Water has two high tides.

port shrank to comparative insignificance except for the continuation of the wine trade. In the thirteenth century a wool trade was established with the continent, and Southampton revived as the port most conveniently placed for the sheep rearing districts of the Hampshire and Wiltshire Downlands. Special wool houses were built, and an officer of the crown—a peysage—was appointed as official wool weigher. This trade was followed in due course (1325 A.D.) by contacts with Italy and Spain. Merchants from Venice and Genoa settled in the town and those from Genoa sought to develop the port (1379 A.D.). Unfortunately their endeavors were frustrated by Edward III who persisted in concentrating trade at Calais.

In 1450 Southampton ranked as the third port of importance in Great Britain, London being first and Bristol second. Large quantities of wax, honey, cotton, flax, sugar, and various fruits were imported from Genoa and the port handled about 12½ per cent of the country's wine trade.

The opening of the route to India round the Cape of Good Hope at the beginning of the sixteenth century was an irreparable blow to the merchants of Venice, and the visits of the Venetian and Genoese fleets to Southampton became fitful and irregular. By 1532 trade with Italy had virtually ceased. Furthermore, a change in commercial policy within Britain restricted trade: the export of wool was discouraged and finally prohibited. The wool was to be kept in England and manufactured into cloth. Thus within a few years both import and export trade were withdrawn and the port declined. Very little trade or movement of shipping were recorded for the next two centuries (1550–1750), though in 1620 the Pilgrim Fathers set sail from Southampton in the *Mayflower* on their epic voyage to North America. A certain amount of trade was carried on with France, Spain, and the Channel Islands, and in the eighteenth century a considerable amount of fish was received from Newfoundland. This trade was lost within a few years to Poole, a port some miles farther to the west.

Prosperity began to return to Southampton in the early part of the eighteenth century, especially after the establishment of regular stage coach journeys between the port and London in 1720. But the revival depended not so much on trade as on the fact that Southampton, in common with Weymouth and other south coast towns, became fashionable as a watering place. Within a few decades the population increased from 6000 to 13,000 and the number of dwelling houses from 700 to 2500.

TWIN FUNCTIONS OF THE TOWN

The Napoleonic wars checked this strange expansion, as the port was required once again to carry men and arms over to France. Government buildings replaced the residential blocks. Barracks to house cavalry units were built in the town and were retained by the War Office to become, in later years, the headquarters of the Ordnance Survey. It was the town rather than the port that was primarily affected by these developments. In fact, during the nineteenth and early twentieth centuries the town gradually assumed twin functions; and the growth and function of the buildings, the distribution of the population, the location of transport terminals, the situation of administrative buildings, and the social activities of the people were divided into two more or less distinct groups. One group served that part of the town whose main interests were connected with the port activities and thus there arose a Terminus Railway Station, Docks Post Office, dock settlements, dock branches of the main banks, docks church, shops to serve the shipping needs and administrative buildings, and shipping offices where the dock administration was centered. The other group served that part of the town which was developing as a normal municipal borough. In due course a civic center was built for the borough administration, a Guildhall, law courts, post-office, railway station, town and country omnibus depots, multiple shops, bank branches, library and art gallery, and residential blocks.

Between these two distinct centers of the town's activities a narrow central core held together the port and town functions. Here, for instance, is located the Bargate—part of the northern remaining section of the old town wall—the official center for much administration covering the more ancient function of the town and port; the head offices of the General Post Office; the head offices of the banks; the offices of the legal profession; many of the old family stores; and, more recently, the warehouses which became distributing centers of goods from the docks to the inland markets.

FIG. 6. Sailing of the "Mayflower" from Southampton, 1620. Copy of an oil painting by C. Forestier. (Courtesy of British Railways.)

THE HARBOUR

The provision of docks was contemplated when the Commission for the

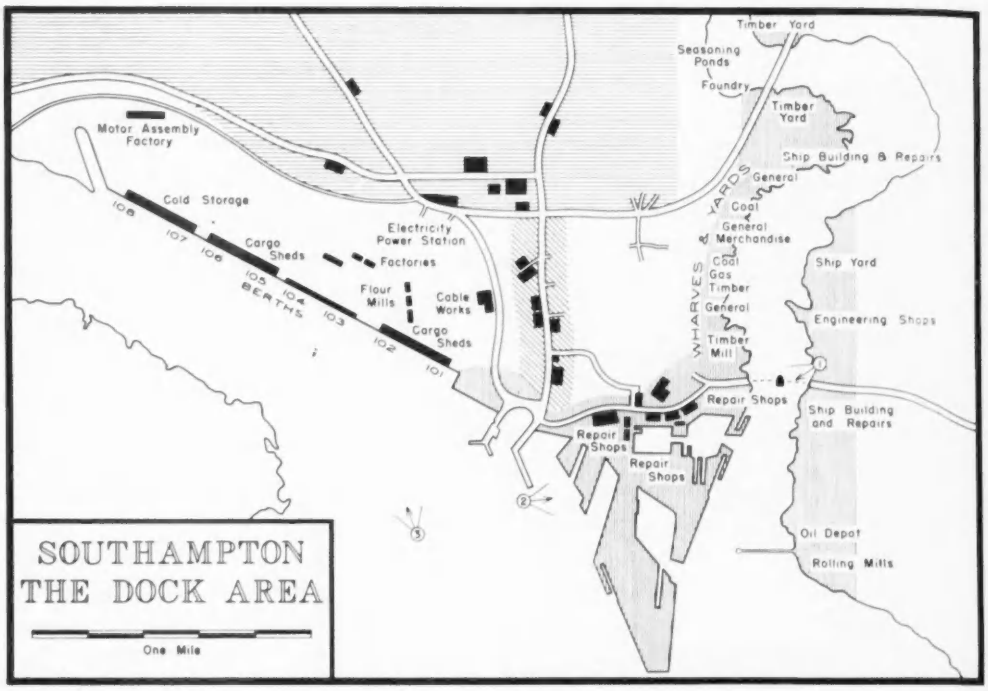


FIG. 7. The Dock Area showing twin functions of the town. Along the Itchen to the east are old docks, wharves, timber pools, workshops, and repair depots. Towards the west is the New Dock area with modern settlements and room for industrial expansion. In the centre is old Southampton, co-ordinating the Dock and borough functions. (The small encircled numbers show the orientation of the photographs that follow: 1, Figure 8; 2, Figure 10; 3, Figure 9.)

Harbour took over the port site from Southampton Corporation in 1803. No constructional work was undertaken, however, until 1836, when the Southampton Dock Company was incorporated by Act of Parliament; and the effective development of the docks dates from that year.

TABLE I

GROWTH OF SOUTHAMPTON (PORT)

	Year	*Estimated Population*
The docks first contemplated	1803	8,254
Incorporation of Southampton Dock Co. by Act of Parliament	1836	23,534
Opening of the Outer Dock	1842	28,500
Opening of the Inner Dock	1851	35,305
Opening of the Itchen Quays	1875	56,211
Opening of the Empress Dock	1890	64,405
Transfer of Docks to London and South Western Railway Co.	1892	65,621
Opening of the Ocean Dock	1911	120,512
Completion of Docks Extension	1934	177,000
Opening of Marine Air Base	1948	178,000

Two famous engineers, Francis and Alfred Giles (father and son) were responsible for the construction of the docks and the layout of the port. By strange coincidence Francis Giles was entrusted with the designs of the London and Southampton Railway which was about to be laid and with the designs of the new docks at Southampton, even though the Docks and the Railways were entirely separate undertakings. Giles grasped the possibilities of co-ordinating the two undertakings and proceeded to provide two closely correlated amenities.

As regards the docks, he provided deep-water quays usable at any state of the tide, and adequate cranes and wharves so that ships could berth, discharge their cargo, and reload as quickly as possible. In addition, he provided railway tracks laid down from the

FIG. 8. Old docks, Southampton. For orientation of photograph see Figure 7. (Courtesy of British Railways.)

FIG. 9. New docks, Southampton. For orientation of photograph see Figure 7. (Courtesy of British Railways.)

ships' berths to the main-line terminus, so that the docks could be rapidly approached from inland, and speedy connection be ensured between the port and London. This innovation put Southampton far ahead of the older ports where little endeavor was made to coordinate the two modes of travel.

The first dock to be built by Francis and Alfred Giles was the Outer Dock, opened in 1842. At this period the docks were used by vessels of the Peninsular and Oriental Steam Navigation Company; by the Royal Mail Steam Packet Company whose fourteen mail steamers sailed between Southampton and the West Indies and South American ports; and by coasting vessels and other ships trading to and from France and the Channel Islands.

In 1845, 158,680 tonnage entered the docks; in 1846 tonnage had increased to 228,771 tons, a 40 per cent increase over the previous year. Accordingly, further construction was carried out. A second wet dock, the Inner Dock, was completed in 1851; and four graving docks, the Itchen Quays, and the Empress Dock followed in quick succession. By 1885 tonnage had reached 2,032,736 tons and several more companies, notably the Union Steamship Company—later amalgamated with the Castle Line—made Southampton their home port. In 1892 the London and South Western Railway Company took over the whole docks undertaking from the Southampton Dock Company and from that time progress became even more rapid.

In 1893 the American Line transferred their New York Mail service from Liverpool to Southampton and this started a steady movement of North Atlantic shipping from the Merseyside to Southampton Water. There were evident advantages in the transfer: continental traffic was acquired through the vessels being able to make a Channel call at Cherbourg; the connection between boat and train was much easier at Southampton on account of the skilful planning by Francis and Alfred Giles; and the rail journey to London was lessened by more than 100 miles. In due course (1907) the White Star Line's North Atlantic Express Service was transferred from Liverpool to Southampton. The Cunard Line followed in 1919. There are now about 25 well-known shipping lines, apart from troopships, maintaining regular services to and from most parts of the world.

Docks Extension Scheme

After World War I (1914–18), during which more than 7,000,000 troops and 3,750,000 tons of cargo passed through the port, a vigorous policy of dock expansion was adopted. Southampton became the home port for the largest liners in the world; with their increasing length and draft it became necessary to deepen the channel approach; and new quays and graving docks were required.

Parliamentary sanction was obtained (1923) to initiate a Docks Extension Scheme. The scheme included the reclamation of more than 400 acres of marshland, the addition of 7,500 feet of deep water quays, and the King George V Graving Dock to accommodate vessels up to 100,000 gross tons. These additions bring the total accommodation in the old and new docks to four wet docks, and river quays affording 30,000 feet of berthing. There are also seven dry docks. Vaults were extended for the storage of bonded goods, such as wines, spirits, and liqueurs; specially adapted warehouses were provided for the tobacco trade; and other warehouses were built for other dutiable goods such as sugar, dried fruit, tea, coffee, cocoa, matches, and silk goods.

The use of mechanical equipment was extended, and today the docks are provided with a complete system of loading, discharging, and operating appliances, including electric cranes ranging from two to 50 tons; two floating cranes of 150 and 60 tons respectively; mobile cranes, electric trucks, tractors, and stacatrucks.

A coal jetty and coal docks were built to meet the needs of outgoing vessels for bunker coal; and oil storage depots have been added at the port and along the shores of Southampton Water the largest oil refineries in Europe are in course of construction.

Along the banks of the Itchen River and in the dock area itself several of the leading shipbuilding and engineering firms of the country have workshops to undertake ship repairing and refitting. In addition there is an increasing amount of ship construction—not only an old, highly skilled industry of yacht building, but also a newer industry which undertakes the building of ocean going vessels up to 5000 tons.

On the new docks estate about 130 acres of reclaimed land has been set aside for industrial expansion. Flour mills, timber yards and sawmills, assembly plant for engineering equipment, and distribution depots for a variety of industries are already established on this new site.

WORLD WAR II (1939–45)

In the years immediately preceding World War II approximately 19,000,000 tons of shipping entered the docks

FIG. 10. Marine Air Base, Southampton Harbor. For orientation of photograph see Figure 7. (Courtesy of British Overseas Airways Corporation.)

annually, and the port handled about 47 per cent of the country's ocean passenger traffic and over 1.2 million tons of cargo. In addition facilities were provided for the Flying Boat Services of Imperial Airways and Pan American Airways.

Immediately the war broke out Southampton became a principal embarkation and supply port for the British Expeditionary Force. For nearly a year the commercial shipping trade was continued, as well as passing through 800,000 troops and 375,000 tons of stores and equipment for France. After the capitulation of France the port suffered severely from air attacks, and during the years 1940–41 the volume of shipping using the docks was greatly curtailed.

In 1942, however, improvement in the general situation was marked by the welcome arrival of Lease-Lend cargoes. This traffic continued on a large scale until May, 1944, when the port became solely an operational base with its activities devoted exclusively to preparations for the invasion of the continent on "D" Day (June 6, 1944).

From "D" Day until the end of 1945, the port handled a vast amount of Allied Military traffic.

TABLE II

TOTAL MILITARY TRAFFIC THROUGH THE PORT OF SOUTHAMPTON, FROM "D" DAY TO "VJ" DAY

	Personnel	*Stores and Equipment (tonnage)*
British Military	500,000	800,000
United States Military	3,000,000	2,400,000
	3,500,000	3,200,000

Despite the dislocation caused by World War II and the present economic situation, the trade of the port is gradually returning to pre-war levels.

FUNCTIONS OF THE PORT

The port fulfills three main functions: it has become the foremost passenger port in Great Britain; it handles an increasing amount of import and export cargo; and it is the principal Marine Air Base of the British Isles.

More than 70 per cent of the ocean passengers using the ports of Great Britain pass through Southampton; and about 87 per cent of the passengers between Great Britain and the United States of America embark or disembark at the docks. The location of the docks within 75 miles of London and at the convergence of the main shipping lanes to world ports, together with the special facilities for rapid handling of passenger traffic, has encouraged the gradual transfer of passenger shipping to Southampton. In addition, there is considerable cross-Channel traffic; each year nearly 300,000 passengers cross between Southampton and St. Malo and the Channel Islands.

The cargo trade has grown steadily, but more slowly than the passenger traffic. For many decades the main industrial locations of Great Britain were remote from Southampton; but as industry gradually moved southwards, and there was a dispersal of industrial siting on account of improved transport facilities and distribution of power, the amount of import and export cargo passing through the port steadily increased.

Imports are varied and extensive, such as fruit, grain, meat, vegetables, timber, coal, wool, hides, skins, cork, jute, leather, metals, rubber, tallow. These goods are dispatched inland by rail or road to the industrial areas; some are transshipped to the Continent.

Fruit and vegetables figure prominently in the Import List. Normally a wide variety of fruit is received from

all over the world. Particularly important is the South African fruit trade, which is almost back to its pre-war level. Enormous quantities of Cape citrus and deciduous fruits are dealt with in the course of a year, and large shipments of tomatoes and potatoes from the Channel Islands are imported during the summer months for distribution to all parts of the country.

The growth of the fruit trade was fostered by the provision of facilities for rapid discharge and dispatch of perishable cargoes, by auction sales of fruit on the dock estate, and by cold store accommodation in the docks and insulated vans to take the produce to the markets.

Before the war extensive cold storage facilities were available for cargoes of meat, fruit, and dairy produce regularly received from Australia, New Zealand, and North and South America. Unfortunately, the main Cold Store was destroyed in an air-raid in 1940, but a new store has already been planned to replace it in the New Docks.

Shipments of grain entering the port have increased since the erection of grain and flour mills on the new docks estate. Cargoes of timber from the Baltic and North American ports are handled mainly at the docks, though some timber ships go to berths in the Itchen River.

In addition to the commodities requiring speedy handling or special storage facilities, there are imports of general cargo, manufactured goods, machinery, canned foods, tobacco, foodstuffs, and raw materials.

Exports consist for the most part of manufactured goods, iron and steel manufactures, rubber products, and hardware, from the Birmingham district; motor cars from Coventry and other centers; woolen and worsteds from Yorkshire; lace and hosiery from Nottingham and Leicester; leather goods from Northants; and tobacco for re-export. These goods are exported to most of the countries sending imports.

MARINE AIR BASE

Nearly 2000 years ago, when Roman galleys came sweeping up Southampton Water, Southampton became a great seaport. Today, the port has entered a new phase as the principal Marine Air Base of the British Isles.

Southampton Water offers exceptional facilities for the operation of flying boats. The long stretches of quiet, protected waterways that flank the deep water channel and the docking facilities at the port make Southampton eminently suitable as a Terminal.

Flying boat services were started in 1929, first to the Empire and then to America. These services increased until the outbreak of World War II, when the Terminal was transferred to Poole Harbour.

After the war, successful developments in docking flying boats led to the allocation of a berth in the Old Docks to the British Overseas Airways Corporation; and Southampton resumed its position as the Terminal.

Regular air services both passenger and cargo now connect the port with East and South Africa, with the Mediterranean, the Middle East, and India, and with Australia and New Zealand, though these services may be curtailed until the new Princess Flying Boats which are being built at Cowes—opposite the entrance to Southampton Water—are in operation.

ACKNOWLEDGMENTS

The author is indebted to the Docks and Marine Manager, British Railways, Southern Region, for much information and also for permission to reproduce Figures 6, 8, and 9.

THE BURLEY TOBACCO REGION OF THE MOUNTAIN SOUTH

Loyal Durand, Jr. and Elsie Taylor Bird

Dr. Durand, professor of geography at the University of Tennessee, is especially well known for his publications on the geography of the dairy industry. In the current article he was assisted by Mrs. Bird, instructor in geography at the same university.

TENNESSEE has long been one of the five principal states in tobacco acreage and production (North Carolina, Kentucky, South Carolina, Virginia, Tennessee).

TABLE I

TOBACCO PRODUCTION, 1946, POUNDS

1. North Carolina	904,270,000
2. Kentucky	475,535,000
3. South Carolina	168,200,000
4. Virginia	167,000,000
5. Tennessee	159,949,000

The tobacco area of East Tennessee is a part of the burley portion of the American tobacco region (Fig. 1), while the main tobacco area of north-central Tennessee, separated from the first-named district by the Cumberland Plateau and mountains, is a segment of the dark fire-cured tobacco area of the nation (see Walter A. Browne, "Dark-Fired Tobacco Region of the North Highland Rim," *Economic Geography*, Vol. XIV, No. 1, January 1938, pp. 55–67), although some burley is grown in the eastern portion of Middle Tennessee, in the counties immediately west of the Cumberland Plateau (Fig. 2).

The burley tobacco area of hilly and mountainous eastern and northeastern Tennessee and extreme southwestern Virginia and mountainous western North Carolina has been characterized by increasing intensity and activity during the past two decades, by areal expansion of tobacco production to farms that did not engage previously in the growing of the plant, by the construction of new warehouses and marketing facilities, and by increasing relative and absolute importance of tobacco in the regional economy. So marked has been the growth that tobacco, during 1947, replaced cotton as the major Tennessee statewide crop in value—a statistical oddity, it may be added, because tobacco is the outstanding product of East Tennessee and cotton of West Tennessee; there is practically no overlap of acreage within any county of the state, and the burley tobacco and cotton acreages are removed from one another by average distances of 100 to 300 miles, with maximum distances of over 500 miles, and yet lie within the same state border (Fig. 3).

Evidence of the importance of hilly and mountainous East Tennessee, southwestern Virginia, and western North Carolina in the burley industry is not confined alone to farm neighborhoods, where the ubiquitous tobacco patch may be seen in valley bottoms, on hill sides, on upland slopes, and in precipitous mountain fields, but is also present in the towns and cities which serve as marketing centers for the crop. New tobacco warehouses are being con-

structed. A total of 44 large tobacco warehouses and auction floors now exist in the six marketing centers located in Tennessee from Knoxville to the northeastern corner of the state. These towns are Knoxville, Morristown, Rogersville, New Tazewell, Greeneville, and Johnson City. In addition the two nearby marketing centers of Asheville and Boone, North Carolina, possess nine and three additional warehouses respectively, and are intimately integrated with the burley area of Tennessee, because the western mountainous counties of North Carolina engage in burley production, while the central and eastern Piedmont and Coastal Plain portions of the state grow other varieties of tobacco. Abingdon, Virginia, eight miles north of the Tennessee state line and eighteen miles *west* of the northeastern corner of Tennessee, also possesses marketing facilities, has eight tobacco warehouses, and is regionally a part of the "mountain burley" area of the hill country Upper South. The city is the only burley market in the entire state of Virginia. Greeneville, Tennessee, the county seat of Greene County, the nuclear core of the burley area, possesses 15 separate tobacco warehouses, and Knoxville claims the largest single tobacco warehouse under one roof in the world—360,000 square feet, or nearly nine acres of floor space. The above visible landscape elements, ranging from mountain burley patches of as little as one-half acre in size to a total of 64 large tobacco warehouses and sales floors, plus production figures and distributional maps, bear out the increasing relative importance of this hilly regional segment of both the overall American tobacco region and that portion of the national region devoted to production of the burley types of tobacco—that part of the eastern United States that lies poleward of the Cotton Belt and equatorward of the Corn Belt (Fig. 5).

It is the writers' belief that the rise of East Tennessee and immediately adjacent areas in tobacco production is in large part owing to (1) the need for an intensive cash crop on the very small farms of the hill and mountain lands, which today average only about 50 to 60 acres in size (Fig. 6), with but 30 per cent of their area under cultivation, and (2) to increasing need for a cash crop under present economic conditions on hundreds of small landholdings which for many recent census periods have been classified as *subsistence farms*, but which are now emerging as "tobacco farms." The American economic setting has forced thousands of former subsistence farmers and their children to seek more cash to purchase necessities of life; to migrate to Detroit, Youngstown, and other industrial centers; to seek employment in the newly founded industries that have located in the region, such as the chemical industries at Kingsport,

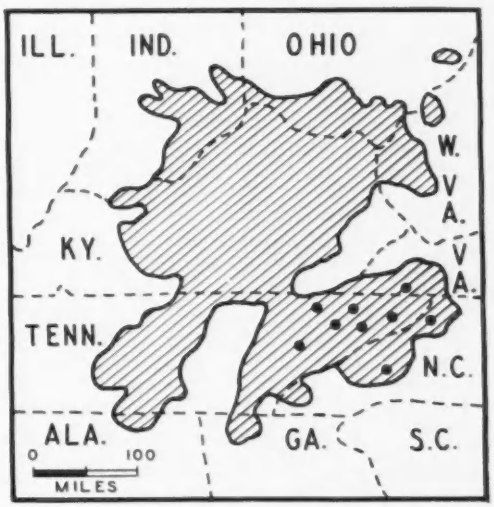
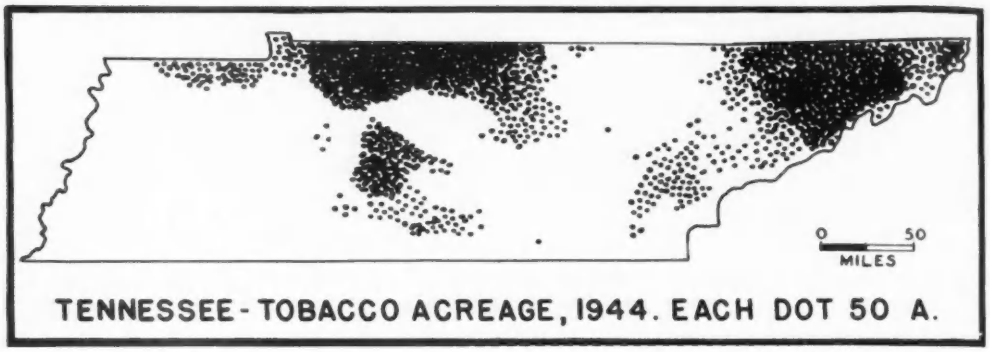
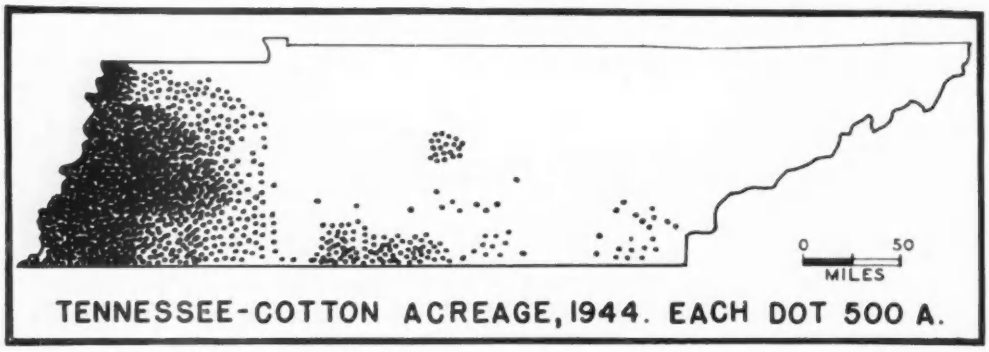


FIG. 1. The American Burley Tobacco Area —type 31 of United States tobacco types. In addition there is a small burley acreage in Missouri and Kansas. Notice that the burley area of East Tennessee, southwestern Virginia, and western North Carolina is a well-defined unit in itself. The nine dots indicate the location of the burley tobacco markets of the Mountain South.





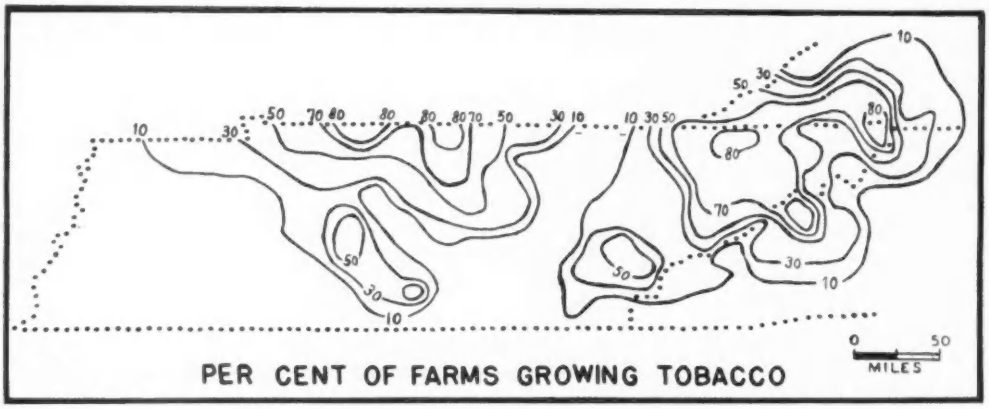


FIG. 2. The tobacco of East Tennessee is burley tobacco; that of north-central Tennessee is dark fire-cured tobacco. Some of the acreage of Middle Tennessee is burley. In the eastern part of the state the tobacco acreage is concentrated in Upper East Tennessee and more scattered in Lower East Tennessee.

FIG. 3. Cotton is the principal crop of West Tennessee, and is completely absent from all except the extreme southern portion of East Tennessee. Notice that there is practically no overlap of the tobacco and cotton acreage within the state. (Compare with Fig. 2.)

FIG. 4. More than 70 per cent of Upper East Tennessee farms grow tobacco, and in three areas of the Tri-State region the percentage exceeds 80.

rayon industries at Morristown, aluminum industry at Alcoa, atomic energy industry at Oak Ridge, or the varied industries of Knoxville; or to enter coal mining in the nearby Cumberland Plateau counties of Virginia, Kentucky, and Tennessee. Despite local industrialization, and despite an export of population of amazing proportions from the hill lands of East Tennessee and Western North Carolina, the population density on the farms is great, there is considerable pressure of population upon the land resource, and the combination of early marriages and generally large families tends to continue the pressure. Tobacco, as an intensive crop, utilizing only a small area per farm, provides both a necessary cash income and employment for family labor. Tobacco can be grown on all types of the local terrain, and on many mountain and hill farms is the chief source of income even though grown on as little as eight-tenths of an acre. Later evidence will be presented to substantiate the premise set forth above, and to show the correlation between tobacco districts and size of farm. While presenting this premise for East Tennessee, the writers do not present it as an operative factor within other tobacco areas, even within other burley areas, such as those of Kentucky.

PART I. THE PRODUCTION AND MARKETING OF BURLEY TOBACCO

The Tennessee Burley Area

The burley tobacco of East Tennessee is produced mainly in the narrow, triangular northeastern portion of the state, from approximately the city of Knoxville northeastward to the extreme state corner at the common meeting point of Tennessee, Virginia, and North Carolina. This northeastern narrow section of Tennessee lies between Kentucky and Virginia to the north, and North Carolina to the south. Tobacco culture is now spreading southwestward from Knoxville into the lower portion of East Tennessee, between Knoxville and Chattanooga, but is still confined principally to the districts in proximity to Knoxville. The region southwestward from Knoxville, to and including Chattanooga, is locally known as Lower East Tennessee, and will henceforth be referred to by that regional term. The main tobacco area, upstream, or literally "up" the Appalachian Valley from Knoxville, receives the local designation of Upper East Tennessee (Table III).

The Tennessee burley area is a segment of the larger burley area (designated as Tobacco Type 31 by the United States Department of Agriculture) that includes much of central and eastern Kentucky and small districts of southeastern Indiana and southern Ohio; and that "overflows" from the eastern part of Tennessee into the Appalachian Valley counties of extreme southwestern Virginia, and into the rough Appalachian mountain counties of western North Carolina (Fig. 1). Areally the greatest proportion of the American burley region is thus associated with the states of Kentucky and Tennessee (Table II).

TABLE II

PRODUCTION ESTIMATES, BURLEY TOBACCO, 1948
United States Department of Agriculture

State	*Estimated Production, Lbs.*	*% of U. S. Burley*
1. Kentucky	347,900,000	66.26
2. Tennessee	104,400,000	19.88
3. Virginia	19,890,000	3.79
4. North Carolina	16,500,000	3.14
5. Ohio	14,700,000	2.80
6. Indiana	12,285,000	2.34
7. Missouri	5,830,000	1.11
8. West Virginia	3,308,000	.63
9. Kansas	220,000	.04
	525,033,000	99.99

Average yield per acre..... 1946—1256 lbs. per acre
1947—1170 lbs. per acre
Estimated..... 1948—1284 lbs. per acre

The Terrain of the Tobacco Area

The land surface of the major part of the Tennessee burley tobacco area and of southwestern Virginia is everywhere rough and broken, but is orderly in pattern, as it constitutes a portion of the Folded Appalachian physiographic region. Long northeast-southwest trending ridges of the Folded region dominate the natural scene, and are most prominent toward the northwestern side of the physiographic province. Some of these ridges, such as Clinch Mountain, attain the proportions of true mountains, but most of them have relief which places them in the geographic classification of rough hilly country. Narrow valleys parallel the ridges, and are in themselves rough to rolling, possess steep slopes, and are "valleys" only in deference to their local regional setting. Trenched well below most of these valleys are the present rivers, which parallel one another in trellis pattern—the Powell, the Clinch, the Nolichucky, the French Broad, and others. The eastern side (literally southeastern) of the Folded Appalachians is the well-known "Great Valley." The name is somewhat of a misnomer for those who know the Pennsylvania Great Valley, the Shenandoah Valley, or even the same valley in Lower East Tennessee. This is because the "Great Valley" in Upper East Tennessee and southwestern Virginia is itself a water parting, and stands from 1600 to 2500 feet above sea level, or actually higher in altitude than the ridges of the Folded Appalachians in parts of Pennsylvania. Toward the northeastern corner of the state the valley is inordinately rough, and even throughout much of its Upper East Tennessee extent falls into the classification of hill country.

The tobacco farmers of the East Tennessee area and the triangular southwestern point of Virginia thus cultivate lands which are rolling to rough, and possess within their farm borders only occasional fields which are level. Some stream flood plains do attain flatness, but the largest formerly flat areas have been flooded for nearly two decades by the man-created lakes of the Tennessee

TABLE III

ACREAGE OF TOBACCO, SELECTED COUNTIES

County	*1889*	*1909*	*1929*	*1938*	*1939*	*1944*
			Upper East Tennessee			
Carter	6	4	101	251	536	661
Claiborne	11	15	1,632	1,633	2,501	3,040
Cocke	699	104	1,845	1,305	2,159	2,688
Greene	1,182	2,192	7,632	5,971	8,377	8,462
Hamblen	112	113	926	1,047	1,543	1,853
Hancock	30	35	577	1,093	1,727	1,920
Hawkins	114	31	2,326	1,943	3,172	3,169
Jefferson	28	10	1,526	1,326	1,609	1,729
Sevier	94	32	657	728	1,290	1,642
Sullivan	61	8	1,001	937	1,559	1,889
Washington	176	632	2,501	2,083	2,769	3,371
			Lower East Tennessee			
Loudon	7	None	428	423	743	789
McMinn	22	6	251	422	611	942
Monroe	32	13	869	923	1,196	1,280
			Total Acreage for *all* of East Tennessee			
East Tennessee	3,177	3,358	27,215	25,601	36,861	41,268

Valley Authority (Fig. 5). The corrugated ridge-and-valley country, dotted with small landholdings themselves squeezed between ridges or "hills in the valleys," thus provides the natural setting for the farms which engage in tobacco production.

Two types of terrain not present in the main tobacco areas margin them. To the north and northwest is the Cumberland Mountain portion of the Appalachian Plateau, to the south and southeast are the crystalline Southern Appalachian Mountains, locally called the Great Smokies between the French Broad and Little Tennessee Rivers, and the Unakas to the northeast of the French Broad. Farms ascend the slopes of each marginal region, and continue into them. The escarpment of the Plateau is rather continuous along the tobacco area, but is notched by the wind gap of Cumberland Gap at the common meeting point of Kentucky, Virginia, and Tennessee. Tobacco culture continues into the plateau, especially into Claiborne County, Tennessee, and the income from the sale of burley often constitutes a relatively higher percentage of the annual income of a Plateau farmer than of a Ridge-and-Valley farmer, as the latter has a wider choice of possible crops and more cultivated acres per farm. Tobacco patches thread the dendritic valleys of the Plateau counties of Tennessee, and provide a cash crop for the farmers who have not been drawn into the labor supply of the numerous Plateau coal mines. The true mountain farms are to the southeast, in the Tennessee and North Carolina portion of the Smokies and Unakas, at altitudes of 2000 to 4500 feet. (Several peaks rise to over 6000 feet, the highest 6642.) These highland farmers also engage in tobacco production, sometimes on slopes of 30 to 40 degrees. Very small patches of tobacco are grown per farm, but the crop bulks large in the local farm income.

The Tobacco Farmers

The farm population of the East Tennessee–Southwestern Virginia–Western North Carolina burley area is solidly of the white race (Fig. 21), of early American ancestry, and dominantly of Republican political persuasion. The first Tennessee settlers, who began arriving in 1769, either migrated across the Appalachian mountains from Virginia or North Carolina, or moved "down" the Great Valley from the Shenandoah section of Virginia, or from southeastern Pennsylvania. Today the rural husbandman prides himself on his Anglo-Saxon origin, meaning by this English or Early American of English extraction. In fact, however, the Pennsylvania German is represented by numerous descendants, most of whom now bear Anglicized-German names, and the descendants of Celtic Scotch-Irish frontiersmen are so numerous that they provide local telephone directories with a considerable "Mc" section. Aside from the origins of antiquity, however, the rural population is of solid early American ancestry, and is descended from frontiersmen who came originally from the Middle Colonies, or from the frontiersmen who crossed the mountains after their colonial term as indentured servants had expired. Negro tobacco farmers are practically non-existent, and the negro is confined to a very few towns of the region. The bulk of the farm operators are descendants of the group sometimes spoken of by historians as "the southern yeoman" to distinguish them, as free farm operators even during the days of permissible slavery, from the southern plantation-owning and slave-holding whites of the Cotton Belt. The culture of tobacco within the region, from the

earliest beginnings of the crop to and including the present, has thus been associated with a white farm population, both as to ownership and tenants; labor is furnished mainly by members of the family, or by occasional hired white labor when the family supply is not adequate.

The Climate and Soils of the Tobacco Area

The microclimates experienced by the tobacco farmers of the tobacco area are varied, as exposure, altitude, and relative location have a considerable local effect. Generally, however, the region lies on the "altitudinal" transition between the Humid Subtropical lands of the South, and the Humid Continental Long Summer areas of the middle interior, with a general tendency toward the latter—depending in part, though, on the definition used for the boundary zone. The season is too short and too cool for cotton, and tobacco completely replaces this plant. Thousands of local inhabitants, although living in Tennessee or North Carolina, have never seen a cotton field. An average frost-free season of 170 days at higher altitudes (up to 3600 feet) and 200 days at lower altitudes is more than adequate for burley tobacco to reach maturity. In fact there is no great "rush" on the tobacco farms owing to too short a season. Annual rainfall of 48 to 52 inches is also more than sufficient, and rarely is tobacco affected by a dry period.

Tobacco is grown on practically all soil types of the region, ranging from alluvial soils through upland woodland soils derived originally from sedimentary

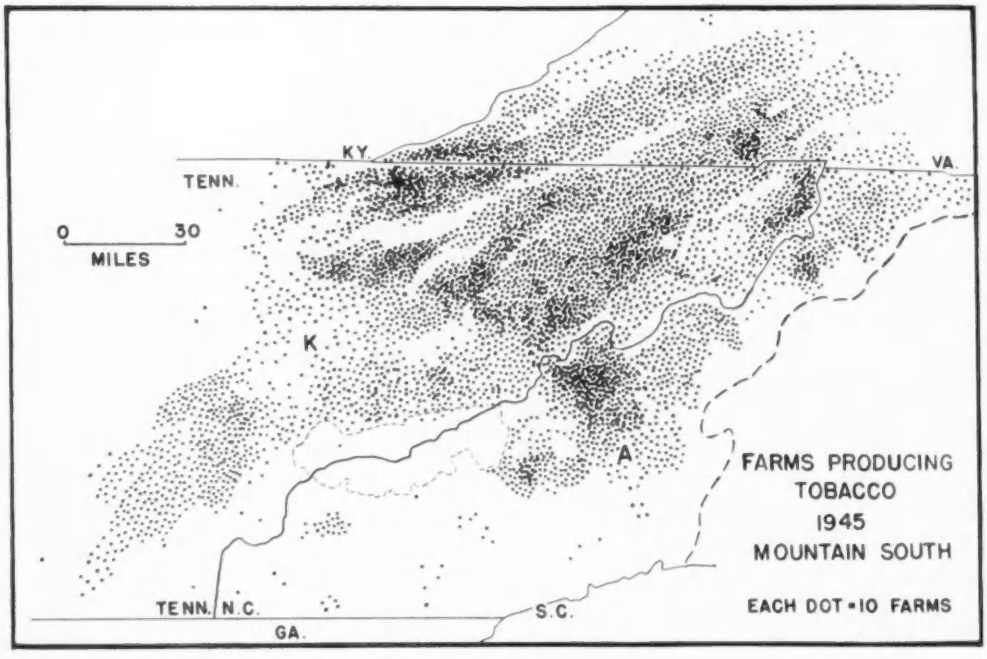


FIG. 5. The distribution of tobacco farms in East Tennessee, southwestern Virginia, and western North Carolina. The blank area north of Knoxville is Norris Lake, that to the northeast is Cherokee Lake, and to the east Douglas Lake—three lakes created by the Tennessee Valley Authority. The long northeast-southwest blank area, extending from northeast of Knoxville into Virginia, is Clinch Mountain. The areas of greatest tobacco intensity are all east and northeast of Knoxville, extending to Abingdon, Virginia, and Asheville, North Carolina. The "K" indicates the location of Knoxville, the "A," Asheville. The dashed line to the east is the Blue Ridge Escarpment, marking the eastern edge of the Southern Appalachians.

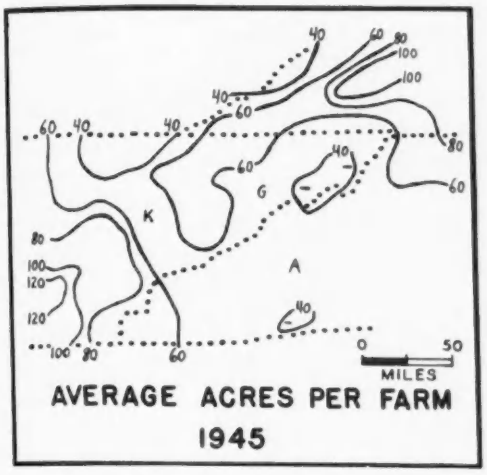


FIG. 6. Farms of the Mountain South, from Knoxville eastward and northeastward, average from 33 to 70 acres in size. Notice the appreciable increase in the average size of the landholdings of Lower East Tennessee, southwest of Knoxville, still in the Folded Appalachians.

rocks, to certain stony soils on steep slopes of the Smokies and Unakas. Silt loams and clay loams of many soil series are utilized for tobacco. Even though burley is highly sensitive to soils, and varies in quality from one soil to another, within the general region tobacco culture is widespread over many diverse soil types. This, however, does not mean that certain soils are not far superior to others, even in the regional culture of the burley plant.

The Historical Background of East Tennessee Burley Production

The growing of burley tobacco has been a farm enterprise in East Tennessee since shortly after the Civil War. Before the shift to burley the frontiersmen and farmers of the northeastern hill country and mountainous region of the state had produced dark flue-cured tobacco ever since the days of earliest settlement, beginning in 1769. The shift to burley by the growers of the late 1860's and 1870's was thus not revolutionary in the introduction of a new crop, because two to four generations of tobacco farmers had preceded them. In fact, the question as to whether or not tobacco culture was introduced originally to the region by the pioneers from southeastern Pennsylvania, North Carolina, and Virginia, or whether the early settlers merely continued a crop grown locally by the Overhill Cherokee Indians of the region, remains unsettled. No doubt both imported seed and indigenous seed was utilized by the original backwoodsmen although there is some evidence that seed was brought from some of the interior counties of Virginia and North Carolina. The probabilities are, however, that the crop was "transported" by the settlers to the present Upper East Tennessee region of production because most Indian records of tobacco culture in what is now East Tennessee were farther southwestward, in the basins of the Hiwassee and Little Tennessee Rivers.

Dark flue-cured tobacco was grown by the farmers of East Tennessee for one hundred years or more. The production reached some commercial significance at an early date; historical records indicate that tobacco became important as a cash crop as early as 1783 on the

FIG. 7. One of the relic log barns of Greene County, Tennessee. This structure was used for flue-cured tobacco before the shift to the production of air-cured burley.

bend of the Nolichucky River in what is now Hamblen County. At later dates, but during the pre-railroad era, tobacco was shipped southwestward down the Tennessee River from some of the producing areas, or was hauled northeastward by wagon to east coast markets.

The early flue-cured industry was small, rather primitive, and beset with governmental and transportation difficulties. Log barns, some of which still remain as relic forms in the landscape, used for machinery or feed storage, were utilized for tobacco-curing (Fig. 7). Tobacco was hung in these barns after harvest, the interstices between the logs were sealed with plastic clay, and the heat from log fires was circulated into the barns by means of flues or pipes. Few farmers produced enough tobacco to fill a 900 to 1200 pound hogshead, the container in which the tobacco was shipped to distant out-of-state markets. At one time the United States government, which considered tobacco a luxury and revenue-producer, had placed a prohibition upon the sale of tobacco to anyone but a licensed dealer. The dealers found it difficult to operate among the hill farms, with their small tobacco patches and limited production, and other more concentrated tobacco areas forged well in front of Upper East Tennessee. Also, from 1858 to 1877, by state law, only the County Court (the county legislative body in the state of Tennessee) could build or rent warehouses for the inspection of tobacco for sale. Thus distance to markets, federal and state bureaucratic controls, and the lack of need for a cash crop by the majority of the regional "self-sufficient" farmers of the period all tended to keep the acreage and production limited. The time was ripe, however, for a shift, and for the opening of wider markets, in part during the 1860's and 1870's owing to the fact that East Tennessee was on the Union side during the Civil War, and had, as a result, a favorable market location and

FIG. 8 (left). Tobacco farms on the slopes of Rich Mountain in Watauga County, North Carolina. The valley in the foreground is 3100 feet above sea level, the crest of the ridge on the upper right is 4400 feet. Permanent grasslands cover the greatest percentage of the land area, but tobacco patches of from one-third to seven-eighths of an acre per farm provide a high proportion of the annual farm income.

FIG. 9 (right). A farm in Watauga County, North Carolina. The farmhouse is at 3300 feet above sea level. Nearly all of the cultivated acreage of this 41-acre farm is in view. Two tobacco seed beds are in the foreground, on the slope below the house. Although this scene is one of middle May the tobacco has not yet been transplanted to the fields at this elevation. Notice the strip-cropping of the fields, the small apple orchard, and the dairy barn. The warmest month at this location, as recorded at a cooperative station three miles away, is July, averaging 67 degrees.

FIG. 10. A Greene County, Tennessee, tobacco farm in early April. This farm has recently been established from a larger landholding, and the tobacco barn is new, as can be observed from the appearance of the lumber.

FIG. 11. Tobacco farms between Greeneville and Camp Creek, Tennessee. The close spacing of the houses and tobacco barns reflects the small size of the landholdings. The galvanized iron roofs of the barns are typical of East Tennessee. The field in the foreground contains tobacco stubble from last year's crop.

FIG. 12. Preparation of tobacco fields at Camp Creek, Tennessee. Part of this field will be in tobacco, the rest in corn. The white building is the Camp Creek schoolhouse, and the other buildings are those of a Baptist Orphanage for mountain children. The Unakas rise sharply here, with the Tennessee–North Carolina state line following the crest.

access to capital for development with respect to the southern areas of the former Confederacy.

The Shift in East Tennessee to Burley Production

Mr. Clisby Austin of Greene County, Tennessee, was the pioneer instigator of burley tobacco production. His factory in Greeneville manufactured plug tobacco for local markets. To supplement and improve the home-grown raw material he had been purchasing tobacco grown in southern Ohio. Realizing the superior quality of this tobacco for his purposes, he contracted with several Greene County farmers to grow the type. The "white burley" from which Mr. Austin obtained the seed was "discovered" in 1864 by George Webb of Higginsport, Brown County, Ohio. The origin of burley, and the reason for its name, is not known, but the Ohio burley is said to have originated in Bracken County, Kentucky, and is believed by plant research men to be a mutation of the Maryland broadleaf tobacco. The Tennessee farms that engaged in the pioneer burley production were located on Chestnut Ridge, a broad swell in the Great Valley floor southeast of Greeneville, and this area is now noted as the fountainhead of the state's burley tobacco industry. Actually, however, from the standpoint of time, the first great "white burley" area was southern Ohio and Kentucky, where the industry was stimulated by the serious effects of the Civil War on the fire-cured tobacco industry of Virginia and North Carolina, and where, as a result of use, it was found that burley made a superior chewing-tobacco to that manufactured from the dark red tobaccos of the period.

Burley gradually replaced the heavier flue-cured tobacco in East Tennessee. For a time it was believed, in all seriousness, that burley could only be raised satisfactorily in the Chestnut Ridge section, and in a surrounding region about six miles square. Trials by other farmers nearby eventually proved that the leaf could be grown in a much wider area, and the Greene County nucleus was established. This county, the largest and most productive (in part because of size) in East Tennessee, remains the nucleus, or core region, of burley tobacco production to the present.

The development of local burley marketing facilities dates from 1884. A resident of Greeneville, Mr. Henry R. Brown, noticed the large shipments of hogsheads of tobacco at the railroad station, consigned to markets at Abingdon and Bristol, Virginia. He, in conjunction with Mr. Austin, organized a company, leased an implement building, and arranged for the sale of tobacco that autumn. A second warehouse was soon established by Mr. Silas Bernard in a large stable, and within a short time a third sales warehouse had entered the competitive scene. Needed cash to pay the farmers on the day their tobacco was sold was not available at first, so the warehouses arranged to receive daily express orders of money from Knoxville banks, 75 miles distant.

The Spreading of Burley Production from Greene County to Other Areas of Upper East Tennessee

The burley tobacco acreage of Greene County was but 77 in 1880. By 1910 the acreage had increased to 2192, still far short of the present county total of 8500. Hundreds of subsistence farms originally took no part in tobacco production, but enough commercial farms had undertaken the industry to provide a substantial nucleus before the turn of the century, to establish Greene County as the regional center

FIG. 13 (left). Four tobacco seed beds on south-facing slopes in the brush. The scene is one of the first week in April in Greene County, Tennessee. The leaves have not yet appeared on the trees, although dogwood is in bloom, and the seed beds are exposed to the sunlight.

FIG. 14 (right). View of the usual farm tobacco seed bed, facing south, in the Gethsemane community of Greene County. Note that rough logs are used in the construction of the frame of the bed.

of the industry, and, in conjunction with the warehouses, to establish Greeneville as the hub of the East Tennessee tobacco area. The general regional setting of tobacco culture for some time was thus (1) a burley area in Greene County, (2) continuance of the production of flue-cured dark tobacco in other Upper East Tennessee areas, and (3) some continuance of the flue-cured industry even within the burley nucleus.

The spreading-out of burley production and the elimination of flue-cured tobacco from East Tennessee is essentially a feature of the twentieth century. In large part the expansion from the nucleus to adjacent counties was the result of the obvious prosperity of the burley growers, and the desire of nearby farmers and land owners to share in the annual cash income provided by the winter sales. However, in addition, the areal expansion of the region of culture was the direct result of either promotional schemes, or of "transport" geography. Ever present in the milieu was the increasing need of many farm operators for a cash income, and the continuing subdivision of small landholdings into even smaller operating units.

Several examples of "promotional" spreading of the acreage are as follows. Mr. Hugh Gouchenour and other citizens of Greene County encouraged the growing of burley tobacco in adjacent Hawkins County in 1917. During the winter an agent of the Greeneville Warehouse Association toured this county in behalf of burley production, and signed enough farmers to contracts to guarantee somewhat more than 100 acres of burley tobacco for the crop season of 1918. Within six additional years, owing to farmer meetings, distribution of seed, and the free circulation of the "Burley Booster Bulletin," the Hawkins County burley acreage had increased to 1000. White burley was introduced to Hamblen County in 1919, and the flue-cured types, dominant since 1880, were soon eliminated. During 1920 Mr. Charles Dean and his two sons, in cooperation with the Agricultural Experiment Station of the University of Tennessee, encouraged the farmers of Knox and surrounding counties to plant burley tobacco, and the industry became established near the urban center of Knoxville. The crop year of 1921 witnessed the sale of 60,000 pounds of Knox County burley on the

Greeneville market, 75 miles to the northeast. Increase in production was so rapid that the Dean Brothers established a Knoxville warehouse in a rented building for the sale of the 1923 crop, and then built a warehouse of their own in which 2,000,000 pounds of tobacco were sold during the 1924 season.

One of the major factors in the spread of burley production in East Tennessee, in addition to its promotion by sales agencies, was the movement by and relocation of farmers, a form of "transport" geography. Tenants and owners, moving outward from the Greene County nucleus to more distant rented or purchased farms continued to raise tobacco. For example, a Greene County farmer who purchased a farm and moved 125 miles to McMinn County in Lower East Tennessee during 1924 insisted on "transporting" tobacco production with him. Tobacco was a crop with which he was familiar. The environment proved permissive, but the nearby tenants whom he interested were not familiar with the growth and care of the plant, and lost their first year's crop, while he was successful. Only after he personally guaranteed a certain amount of cash per acre if his tenants did not realize a crop did they take interest. From this "molecular" start the McMinn County acreage has increased to over 1000 during less than 25 years. Other farmers who moved from Greene County did so because of the relatively high land values in the county, and its relatively high farm rents. Unable to rent the best tobacco farms many tenants moved from the county, and in so doing increased the areal spread of tobacco acreage.

Increased tobacco culture during the twentieth century to the southeast and northwest of the Greene County nucleus has resulted in the spread of tobacco production into the Unakas (Fig. 8) and Smokies in the first direction, and into the Cumberlands in the other direction. It is in these areas that the highest percentage (not necessarily numbers) of former subsistence farmers have engaged in burley culture. Tobacco furnishes these small farmers with an intensive crop, suitable to hand operations, and productive on steep slopes. A tobacco field of from one-quarter acre in size to seventh-eighths, or even one acre, may furnish the bulk of the yearly farm income, and still not interfere, on an acreage basis, with the needed land on which corn, vegetables, and other subsistence crops are grown (Fig. 9). Many mountain boys have been aided through their University careers by the tobacco income from farms that are essentially of European type so far as size and intensity of cultivation are concerned—for example, an annual allotment of seven-eighths of an acre of tobacco on a 29-acre mountain farm on the Tennessee–North Carolina line, on the side of Roan Mountain, has furnished the annual support of the family and needed educational funds for college. On a neighboring 41-acre farm in Watauga County, North Carolina, a similar burley patch in size, plus three milk cows, furnishes the annual cash income, and college funds; the other cultivated acres are devoted entirely to subsistence crops for use at home. Throughout the Unakas, Smokies, and Cumberlands, adjacent to the "lowland" tobacco areas, it has been relatively easy for a farm operator to enter burley culture. The needed capital outlay is small, and is represented chiefly by the cost of a tobacco barn, which is built by family labor from home-sawn boards, obtained from the home woodlot. Tobacco sticks, on which the harvested leaves are cured, are home-made. A farm-manufactured rough wooden sled is used to haul the

tobacco down the steep slopes. Thus the mountaineer finds the crop of great importance—inexpensive as to capital, an intensive user of land and labor, and high in eventual return per unit of area—a needed source of annual cash income for the purchase of outside necessities.

The Present Burley Situation

The present burley tobacco acreage and situation is still under the control of the United States Department of Agriculture, and tobacco acreage has been subjected to government control since 1934, when the Agricultural Adjustment Administration instigated the crop control programs. Actual tobacco acreage was at its greatest in many counties during 1932, and has been curtailed since that time, although it is now expanding again (Table III). With the control program, base acreages were determined by the government for each farm on a 1931–1933 acreage base. Those farms growing one acre of tobacco were reduced to seven-eighths of an acre, and other ratios were assigned as tobacco allotments. Cash payments were made by the government to those participating in the program. Government-owner contracts prohibited the landowner from reducing the number of his tenants or share-croppers below the total of 1933. Thus, while the control program originally reduced the total tobacco acreage, it did not change the areal limits of production, or the number of farms engaged in tobacco culture. In time other controls were added, rules were changed, payments for soil-building practices were included, the acreage of leguminous crops was increased, and other agencies of the federal government entered the regional picture. Government price-supports were added when Congress passed that bill; the Department of Agriculture price-support for the 1947 burley crop was $40.30 a hundred pounds of burley tobacco, and the national average price paid for burley was $48.30. The 1948 price support was upped to $42.40 a hundred.

The present spread of tobacco production to farms where it has not been grown previously, but where the operator desires to engage in the industry, is accomplished in the following manner: (1) A farmer who enters production has no base acreage allotment. He plants his tobacco field, tends it, and harvests it. He must, however, be able to prove to the County Agricultural Committee that he has had experience in tobacco culture during at least two of the preceding five years, unless he was in the armed services. The experience may have been gained as a share-cropper, tenant, or operator on a farm that has had a burley allotment. (2) When his crop is sold at the warehouse auction he pays a penalty in money to the government. (3) This establishes his farm on the "accredited list," and brings the landholding an official allotment. The penalties may be high, but the majority of the farmers who have no allotment are willing to pay them for a year in order to obtain a base acreage. There are cases on record of farmers who have paid over half of their crop value in government penalties in order to obtain a tobacco allotment; one farmer reports he sold a crop in the fall of 1949 for $88.97 and paid $71.64 in penalties. In cases like this the individual is looking to the future. This explains in part, however, why the acreage of tobacco and the number of growers can increase despite governmental controls.

Government tobacco allotments go with the farm, not the farmer. The most highly prized farms of Upper East Tennessee, southwestern Virginia, and

mountainous North Carolina are usually those with a large tobacco allotment. When sold, these bring an average higher price per acre than farms with a low allotment. When rented they bring a higher rent per acre. The landlord with a good allotment on his farms is able to have a choice of tenants, and usually is successful in obtaining a good renter because of competition among tenants for the farm.

The Tobacco Year in East Tennessee Burley Production

A. The Winter Landscape.—Late winter begins the annual tobacco year on an East Tennessee–southwestern Virginia–western North Carolina tobacco farm (Fig. 10). The new year's crop preparations may have commenced before the burley of the past year has been sold, hence the frequent statement that tobacco takes thirteen months of the farmer's time.

The site for the tobacco seed bed is selected in January. The preferred sites for the seed beds are (1) southern or eastern exposures (2) on "new" ground in (3) proximity to water. The ideal seed bed site is an old fence row, grown up to brush (Fig. 13). The humus content of the soil under these conditions is relatively high, and the possibility of soil contamination with root diseases less than if the bed is located in a recently cultivated field. The brush around the bed will help protect the small plants from a hot sun later in the season, after the cheesecloth covering has been removed. Proximity to water is desirable because the small plants must be watered frequently with diluted applications of nitrate to assure quick growth.

The tobacco bed sites are prepared and burned between the first of February and the twentieth of March. Brush, logs, and wood trash are piled and burned where the bed is to be located. A smoky, hazy atmosphere pervades the valleys and ridges during this period, as the fires are kept burning slowly. Some few farmers steam the sites of their tobacco beds, but this usual practice of many other tobacco areas is not general or common in the Tennessee burley area.

The soil is either spaded by hand or turned over with a one-bottom horse-drawn plow after the site has been burned. It may be plowed several times, and is always hand-raked carefully many times. The sides of the embryo tobacco bed are then built of logs (Fig. 14), rough home-sawn boards, or purchased planks. East Tennessee tobacco beds are commonly nine feet wide, and from 50 to 100 feet in length. Individual farmers who possess a large acreage allotment may construct several such seed beds.

B. The Spring Landscape.—Tobacco seeds are sown in the tobacco beds between February 22 (a common seeding day at lower elevations), and about the middle of March. The sower seeds the bed as evenly as possible with the fine seed, 300,000 to 400,000 seeds to the ounce. He then tramps in the seed, places the plank or log frame around the seed bed, if he has not done so prior to seeding, and stretches galvanized wire the length of the bed. Cheesecloth or very light canvas is then stretched over the entire bed and held in place with small nails (Fig. 15).

The farmer watches and works with his tobacco bed constantly during the spring. He must water it frequently, weed it, thin out the tobacco plants where they have come up too close together, spray the young plants, and guard against insects.

The tobacco field itself is prepared during March and April (Figs. 11 and 12). Nearly all the available animal

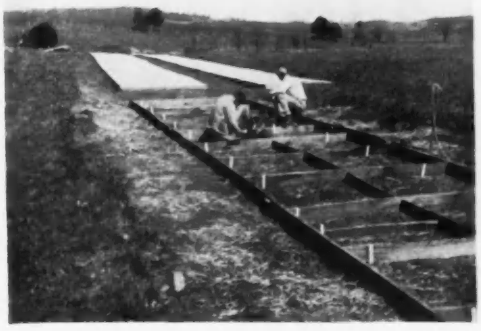


FIG. 15. Well-constructed tobacco seed beds. The small tobacco plants have sprouted.

manure of the farm may be spread on this one field, which in itself is commonly the most fertile field on the farm. Commercial fertilizer is now used in addition by all farmers, but many small farmers must depend on it entirely, as they do not maintain animals on their landholdings. A 3–9–6 mixture commercial fertilizer (3 per cent of nitrogen, 9 per cent of phosphate, 6 per cent of potash) is the chief type used at present.

C. The Summer Landscape.—Summer, based on weather data and fact rather than on the arbitrary mathematics of the sun, reaches the East Tennessee burley area by early May. By about May tenth tobacco transplanting from the seed beds to the fields has begun, and is completed between that date and June twentieth. Those farmers who transplant by hand (and many are forced to by the steep terrain of their fields) await a wet period before beginning operations, and set the plants in rows in the tobacco field a day or two following a soaking rain. Hand transplanting or transplanting while walking with a hand-operated transplanter is still the most common method used in setting the plants in East Tennessee. Farmers who grow a large acreage and who can afford to use mechanical horse-drawn transplanters do not have to wait for a wet period, but "dry set" the plants, the planter watering each as it is placed in the ground.

Cultivation continues during the summer, by mechanical cultivator when the tobacco plants are small and the field is smooth, by hand hoe in steep fields and in all fields after the plants are large enough so that machinery might damage the precious leaves (Fig. 16). The tobacco is also dusted occasionally, or sprayed, to control devastating insects and worms, such as bud worms, cut worms, horn worms, grasshoppers, and flea beetles.

Topping of the burley plant is delayed until it is in bloom. A heavy growth of suckers is allowed to develop. The operation tends to produce a thin leaf of a high grade of tobacco, preferred on the market to a maximum yield per acre of "heavy" tobacco.

Harvest is a late summer operation, August tenth to September tenth. Burley tobacco is usually ready to harvest ninety to one hundred days after it has been transplanted. The entire tobacco plant is cut by hand, and hung, leaf downwards, on a stick which has a metal spear slipped onto one end. Five to six individual plants are placed on each four foot long stick. Farm wagons and trucks usually are used to haul the sticks of tobacco to the tobacco barns, located on each farm and a distinct cultural feature both of the region as a whole and of each individual farm that engages in tobacco production. In the mountains, and on steep hillsides in the Ridge-and-Valley area, wooden farm sleds rather than wheeled vehicles are used to haul the tobacco from the harvest field to the barn.

The ordinary tobacco barn is an unpainted frame building, constructed of rough lumber, ordinarily cut from within the farm boundary. A galvanized iron roof protects it from the

weather, and the thousands of such shining roofs, reflecting the sunshine upwards, characterize the tobacco area of East Tennessee to the passing aviator. The usual tobacco barn is forty feet wide, sixty feet long, and sixteen feet high at the eaves. Such a barn will house about two-and-a-half to three acres of tobacco, and hence is adequate for all but the largest tobacco farms (Figs. 10 and 11).

D. The Autumn Landscape.—Tobacco plant stubs and tobacco barns are the only visible landscape features of autumn that indicate tobacco production in the burley area. The plant, itself, is housed and curing. The first part of the curing process is still under conditions of "summer heat" until about October 1, when more moderate temperatures begin to prevail. Air circulates throughout the barn, admitted by ventilating doors and planks. Air is also admitted through openings beneath the eaves.

The hung tobacco in the barn turns from a wilted green or a yellow color to brown in six to eight weeks. While the tobacco is air-curing, the farmer, between August 26 and October 1, is harvesting corn and seeding winter wheat or other cover crops. The common rotation used in the region is tobacco, followed by winter wheat and two years of grass or clover (bluegrass, lespedeza, alfalfa, red clover, crimson clover). After the fourth year following the tobacco, the clover is spring-plowed, and the field is ready for a crop of tobacco again the fifth year. (The main regional crop rotation is corn, winter wheat, and two years of grass, followed again by corn. Tobacco replaces corn on the limited acreage per farm devoted to tobacco.)

Stripping and sorting of the tobacco in the barn begins about the first of November, when the stem of the plant has dried. The thoroughly dry tobacco leaves cannot be handled, because they will break, crack, and crumble. Consequently these operations are not started until the advent of "casing weather." Tobacco comes into "case" during periods of warmish, humid weather. It then becomes damp enough, and pliable enough, to be handled without danger of breakage. Casing weather in East Tennessee and the adjacent mountain areas is normally associated with the first major cyclonic storms of late October and early November, and commonly occurs when the center of the depressions are passing to the north, on the Ohio Valley track, and the East Tennessee region is in the damp, warmish southeastern quadrant of the storm. Tobacco is also graded when in case during the early morning hours following a frosty night, when the galvanized iron roof has collected a coating of hoarfrost, and the morning sun is melting it.

The farmer and his family, with the addition perhaps of a temporary hired hand, remove the sticks of tobacco from the tier poles during casing weather, take the tobacco from the sticks, strip the leaves from the stalks, sort the leaves into grades, and tie them into hands. There are 25 to 30 leaves in a hand. Stripping and sorting may continue well into the night, especially if the farmer desires to market his crop at the opening of the market season, which has usually been the first Monday in December, but was advanced to November 29, beginning with the 1948 market season. Tobacco leaves are sorted chiefly on the basis of weight or body of leaf, and of color. The farmer, as a result of experience, is usually able to sort his crop in the barn into four to five grades, and the great differences between the highest and lowest grades later on the market floor are usually between the crops of individual tobacco growers rather than within the crop of

one individual. The grades, subject to further checking when the crop reaches the warehouse floor, are designated as (1) wrappers, (2) flyings, (3) lugs, (4) leaf, (5) tips, and (6) nondescript. In addition tobacco is graded by color—buff or straw, tan, reddish tan, red, dark red, and green, and by quality—choice, fine, good, fair, low. Each basket is marked with the government grade, as, for example "Leaf, Good Quality, Tan Color, mixed" is indicated by a grade symbol B3FM.

E. The Early Winter Market-Season Landscape.—The early winter landscape of the East Tennessee–southwestern Virginia–western North Carolina tobacco region is characterized by thousands of truck loads of tobacco on the roads enroute (Fig. 17) to the 64 burley warehouses located at the six Tennessee marketing centers of Greeneville, Johnson City, Knoxville, Morristown, New Tazewell, and Rogersville, the two North Carolina burley marketing centers of Asheville and Boone, and the Virginia warehouses at Abingdon. Complicated traffic patterns emerge from the movement of tobacco farmers to the warehouses. Tobacco moves to East Tennessee warehouses from as far north as Berea, Kentucky, and from as far south as the mountain or Blue Ridge section of northern Georgia. Some East Tennessee farmers haul their tobacco well northward into Kentucky. A farmer near a warehouse center may actually go to a more distant warehouse. Desire to obtain the best price is the motive in the choice of a market center. The warehouses, in turn, advertise their advantages in local and regional newspapers, and over the radio. In general, however, while long distance marketing is the more spectacular, and receives considerable publicity, the bulk of the tobacco marketed at any warehouse center has been grown in its general

FIG. 16. A midsummer scene in a three-acre field of Judy's Pride burley tobacco. This variety has now been largely superceded by Kentucky 16 and other root-rot resistant types of burley.

FIG. 17. Line-up of tobacco loaded trucks. The drivers are awaiting assignment of floor space at a Knoxville auction sales floor and warehouse in early December. (Knoxville Journal Photo.)

FIG. 18. One of the fifteen tobacco warehouses of Greeneville, Tennessee.

FIG. 19. Baskets of burley tobacco on the warehouse floor. The auctioneers move down the narrow rows on one side of the baskets during the sale, and the buyers of tobacco for the cigarette manufacturers walk down the adjacent row, and face the auctioneer across the baskets which are currently being sold. (Knoxville Journal Photo.)

FIG. 20. The year's tobacco harvest of J. C. Combs, a tobacco farmer of Meigs County, Tennessee. (Knoxville Journal Photo.)

FIG. 21. Gene Sharp (left) and Marvin Howard (right), two representative tobacco farmers of McMinn County, Tennessee, with a truck load of burley tobacco. (Knoxville Journal Photo.)

neighborhood, and usually within a 30 to 50 mile radius.

The movement of tobacco from barn to warehouse begins about a week before Thanksgiving, and terminates a work year of 400 man hours of labor per acre. The farmer who moves his tobacco to the sales floor early in the marketing season during late November or early December thus sells the crop eleven months after he has begun work with it, but the farmer who brings his tobacco to the auction in February markets a crop 13 months after he has begun preparations for its production. The late-marketed load of tobacco proceeds to the warehouse through the smoky haze of the new year's burning tobacco seed bed.

The Tobacco Warehouses

The focal market point for burley tobacco growers is the warehouse where the auction sale is held (Fig. 18). The 64 warehouses of the region are located in nine towns, and each warehouse is the site of a tobacco auction. The warehouse itself is a large, low one-story structure built of brick, wood, cement blocks, or galvanized iron sheeting, located on railroad sidings in or near the heart of the town, or on a main highway at the periphery of the community. Greeneville, Tennessee, hub of the burley area of the Mountain South, possesses fifteen separate warehouses, which exhibit both centripetal and centrifugal locations. Nearly all warehouses have railroad siding facilities, but some of the smaller and more recently constructed ones depend upon truck transport for removal of the purchased leaf to redrying plants or pipe tobacco and cigarette manufacturers. Because the warehouse and sales floor is in use only during the sales season of November to March, the building is often rented for other enter-

prises the rest of the year, such uses as automobile and agricultural implement storage, community recreational centers, and the like being common, especially in the smaller towns.

The 15 warehouses of Greeneville have a combined total of 630,000 square feet of floor space. These draw burley from wide areas, but are in themselves in the heart of the belt, Greene County alone growing more than 8500 acres of tobacco within its own boundaries. Knoxville, with two warehouses, claims one to be the largest, under a single roof, in the world. Eight warehouses in Johnson City, the first dating from 1909, handle 11 million pounds or more of tobacco a year. New Tazewell's five large new warehouses reflect not only the marked increase of tobacco acreage in its Cumberland Gap vicinity, but the importance of the rugged Cumberland Mountain county of Claiborne in tobacco production, with the spread of burley acreage into the Plateau. The county tobacco acreage increased from 310 in 1925 to more than 3000 acres during the crop year of 1945. Morristown's six warehouses cover 283,200 square feet, and Rogersville's eight warehouses serve a rapidly expanding portion of the burley belt in Hawkins County. The first of the eight warehouses in Rogersville was not erected until 1939, and the Hawkins County acreage has increased to 3200 from slightly over 1000 in 1925. The eight warehouses of Abingdon, Virginia, are located in the heart of Washington County, one of the leading burley producers of the narrow southwestern "prong" of the state, between Kentucky to the north, and Tennessee–North Carolina to the south. Mountain burley from the coves of the Unakas and Smokies is marketed in large part at the three warehouses of Boone, North Carolina, and the nine of Asheville. Many separate companies operate these various market centers of East Tennessee, southwestern Virginia, and western North Carolina, but there is some interconnection, and Greeneville interests are important at both Abingdon and Asheville.

The 64 warehouses sell practically all of the regional tobacco crop, and in addition attract leaf from some of the plateau counties of Kentucky to the north (the Kentucky portion and the Middle Tennessee portion of the burley belt is not discussed in this paper). The state line of Kentucky, however, is in some respects a "tobacco-shed," and many Kentucky growers market their crop northward 150 miles in the Blue Grass area. To tap the mountain growers of southeastern Kentucky one of the Knoxville warehouse companies has added new marketing facilities and sales floors in London, Kentucky.

One hundred million pounds of burley tobacco are now marketed annually in the Tennessee–Virginia–North Carolina region. East Tennessee warehouses alone sold 78,505,957 pounds during the 1946–1947 market season, and paid out approximately $34,000,000 to farmers. Townspeople share in the season through employment at the warehouses and redrying plants. All floors are open twenty-four hours a day to receive and weigh tobacco. Auctioneers and buyers from distant points crowd the hotels, and merchants anticipate increased sales through the flow of money into their communities.

The Tobacco Marketing

The burley tobacco of East Tennessee, western North Carolina, and southwestern Virginia is marketed at loose-leaf auctions conducted on the sales floors of the 64 tobacco warehouses of the region. Auctions commence immediately after the Thanksgiving season,

the opening date varying from year to year between late November and the tenth of December, but a common opening date is the first Monday of December. All auction floors begin annual and daily sales at the same time. The warehouse is opened to farmers about two weeks before the sale, usually on November 15 to 20, and those who wish to offer their tobacco for sale on the opening market bring their crop to the sales floor at this time.

The truck-loads of tobacco are driven onto the warehouse floor. The farmers unload their leaf, and pack their crop in oak "baskets." These are wicker frames, 40 inches long on each of its four sides; in effect the "basket" is thus merely the base, as there are no upright sides. Tobacco is piled neatly on the basket, and these are arranged in rows on the warehouse floor (Fig. 19). The year's crop of an individual grower may be contained in from one or two, to as many as 15 or more baskets, depending upon his allotment, yield per acre, and number of grades. A loose slip put on the top of each basket indicates the name of the grower, his postoffice, the weight of the tobacco in the basket, and the government grade, as checked later by the inspector (Fig. 20). Farmers are now required to pack their crop on the warehouse floor and are not permitted to place more than 700 pounds of leaf in a basket; usually the average per basket is about 200 pounds. The farmer is charged 50 cents per basket. Until a few years ago they were permitted to obtain a supply of baskets at the warehouse, pack the baskets in their tobacco barns, and deliver the packed baskets to the warehouse.

The auction of tobacco begins at a stated hour each day, and is conducted five days per week. The auctioneer announces the base price per hundred pounds for a basket, and begins his chant (which sounds just like the radio except that even company names are usually not pronounced clearly). Five to seven buyers face him on the opposite side of the row of baskets, each buyer representing one of the major cigarette manufacturers, or operating for himself. The group signals bids in various manners, some buyers calling out, but some bids being made by the lift of an eyebrow, the crooking of a finger, or some other device not observable to the uninitiated. The whole group moves steadily onward, a row of fifty to one hundred baskets of tobacco sometimes being sold in less than five minutes. By warehouse agreement, however, not over 320 baskets of tobacco may be sold per hour. The individual farmer may see his entire year's crop disposed of to the buyers in as little as ten seconds. Following the auctioneer and buyers down the row are warehouse officials. The ticket marker fills in the name of the company making the purchase, and the price received, placing these items on the slip which has been lying on the top of the tobacco piled in each basket. Behind the warehouse officials are the farmers themselves, those whose tobacco has been in the auction, and those who are curious about the prices being paid. The farmer whose tobacco has been sold has the privilege of rejecting the bid; usually, however, he collects his portions of the slip, presents these at the office of the warehouse, and is paid in cash or by check on the spot. Within the space of a half hour or less he has received a large share of his total yearly cash income. If the sale is tobacco of a tenant the warehouse makes the check to the landlord, and the tenant receives his cash for half of the tobacco later. During any individual sale, two to four sets of auctioneers and buyers may be operating on the warehouse floor. These,

with the accompanying clusters of tobacco farmers, provide a lively chant and commotion, ever changing in its location on the auction sales floor.

Warehouse employees, pushing hand trucks, remove the sold tobacco to the packing shed. They begin operations as soon as the sale of a particular row has been completed, so that the space on the floor is cleared, perhaps within a half-day or less. Hardly has this been accomplished before additional farmers, now assigned this space, begin to unload their trucks and pack their crop in the baskets. This daily routine continues for two and a half months, or until mid-February, by which time all of the crop has usually been marketed.

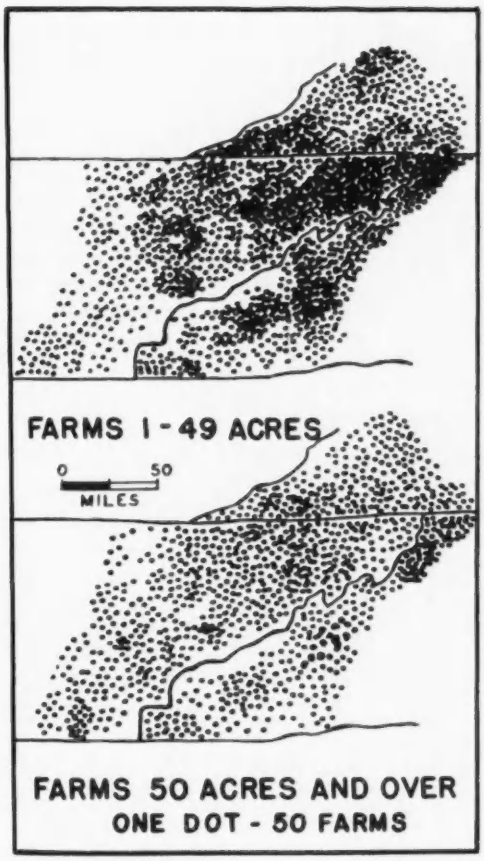


FIG. 22. The farms of Upper East Tennessee, southwestern Virginia, and western North Carolina are small in size. A higher proportion of the farms of Lower East Tennessee are larger in area, and also contain a larger percentage of arable land.

The tobacco which has been purchased by the buyers, after having been taken from the auction floor, is packed in giant stave hogsheads, each holding 1000 pounds. These are shipped by rail or truck to the tobacco redrying plants, where the leaf is stemmed, dried, and blended. The majority of East Tennessee–southwestern Virginia–western North Carolina tobacco is moved by rail to the redrying plants of the cigarette manufacturers located at Winston-Salem, North Carolina, and Richmond, Virginia. However, 40 per cent of the tobacco auctioned at the 15 warehouses in Greeneville is processed at the two redrying plants located in that city. Redrying plants are also located at Morristown and Knoxville.

The redrying plant, whether within the region or at a distant point, blends several hogsheads of tobacco into "perfect grades." After blending, the product is hung on sticks, and carried by machinery through a number of heated compartments whose temperatures range from 140° to 230° F. This dries the tobacco to a crumbling stage. After being cooled, it is remoistened by steam which is circulated through regulated atomizers to all parts of the leaf. The tobacco, during redrying, loses ten per cent in weight, and all of its natural moisture. Only the "artificial" moisture, added by the steam, remains.

The blended redried tobacco is packed in oak, poplar, pine, or other wooden stave hogsheads, each containing approximately 1000 pounds. These are stenciled to show the weight, grade, and crop year, and stored for future use, usually in three years. The redrying plants in the East Tennessee region forward the hogsheads to the warehouses of the cigarette manufacturers, located across the Appalachians from the grow-

ing region of the burley. A truck or railroad freight car piled high with hogsheads of tobacco in East Tennessee may thus be (1) loaded with leaf from the warehouse floor, or (2) loaded with the blended leaf from the redrying plant. All tobacco moves eventually from the region to the concentrated centers of manufacture.

PART II. RELATIONSHIPS OF BURLEY TOBACCO PRODUCTION OF THE MOUNTAIN SOUTH TO SIZE OF FARM

THE VERY SMALL SIZED TOBACCO FARMS OF UPPER EAST TENNESSEE, SOUTHWESTERN VIRGINIA, AND WESTERN NORTH CAROLINA

The tobacco farms of the East Tennessee–southwestern Virginia–western North Carolina portion of the American Burley Belt are very small in acreage (Fig. 22). Upon each farm only a moderate part of the total acreage consists of land in crops, usually less than one-third, because of difficulties of terrain. The fertile hill and mountain peoples have increased their numbers at a rate which has brought considerable pressure upon the land resource on the part of those remaining on the farm. The result is the dependence of thousands of persons upon only 15 to 20 acres for a livelihood, and the continual subdivision of farms already small in area, this process having continued throughout the period when farms in most of the nation were being increased in acreage size. Tobacco, as an intensive crop, is eminently suited to the small farms, provides an income of $1000 or more per acre if of high quality, and also provides a work year for the small operator. The continual expansion of burley tobacco acreage in the region correlates with continual subdivision of the landholdings.

Greene County, the leading county in tobacco acreage, with over 8500 acres of burley, is largely in the Great Valley portion of the Hill and Valley area of the Folded Appalachians, but extends into the Unakas. In 1940, of the very small size groups, this county possessed 11 farms under three acres in size, 564 of three to nine acres, 1498 of 10 to 29, and 1039 of 30 to 49 acres. Within five years, by 1945, the respective figures for each of the four size groups had increased to 280, 714, 1673, and 1097. The farms of these four small total size groups constituted 61.1 per cent of all farms in the county (6155), a county that had 77.2 per cent of all of its farms engaged in the raising of tobacco. Looked at from the standpoint of *acres of harvested crops*, in 1944 only seven farmers in the county harvested 200 acres or more of crops, 51 harvested between 100 and 199, 464 between 50 and 99 acres, 985 between 30 and 49 acres, 1060 between 20 and 29, 1397 farmers harvested 10 to 19 acres, and 2110 harvested less than nine acres of crops apiece per year. In the county—the leading agricultural county of East Tennessee—5552, or 90.2 per cent of all farmers had total crop acreages *per farm* of less than 49 acres, and 74.2 per cent of all farmers harvested only 29 acres or less of crops. Working negatively from the statistics (merely to check field work) it is obvious that if only 64.4 per cent of the farms harvested ten acres or *more* of crops, and 77.2 per cent reported tobacco, that tobacco *must* be grown by many farms whose total acreage of crops per farm is in the one to nine acre group. Actually tobacco is relatively of greater importance on the small farms than it is on the large ones, and many of the farms whose *total* (not harvested) acreage is under 19, and even under nine acres, are actually tobacco farms, and the operator

depends upon his burley tobacco acreage for a livelihood.

Mountain counties show more extreme conditions. In Carter County, Tennessee, 1963 farms or nearly two-thirds of the total number of farms (3127) are 29 acres or *under* in size; slightly over 27 per cent of all farms in the county are nine acres or under in total size. Somewhat more than 71 per cent of *all* Carter County farmers harvest nine acres or less of crops, and, at the other extreme, only five farmers in the entire county harvest more than 100 acres of crops apiece. The number of three acre farms in the county increased from one to 70 during the five year interval of 1940 to 1945, and the number of three to nine acre size farms increased from 636 to 790. Today the average size of the 3127 farms in this mountain county is only 33 acres, and conditions of pressure of the human resource upon the land resource are almost incomprehensible to the midwesterner, and become almost those of certain European areas. However, tobacco, with yields of 1000 or more pounds per acre, may more than compensate in value for the low total acreage of the farm, and seven-eighths of an acre of burley (the county average per farm for those growing tobacco) provides a large share of the cash income.

The examples given above for a leading Ridge-and-Valley county and a mountain county in the burley area may be multiplied within the region at length. Conditions to the west or northwest, in the Cumberland Plateau, are similar so far as farm size and acres of harvested crops per farm are concerned. Claiborne County, Tennessee, partly in the Plateau and partly in the Folded Appalachians, contains 3187 farms, averaging 49.9 acres in size. Nearly eighty per cent (79.5 per cent) of all the farms in the county raise burley tobacco; only 22 per cent of all the farms in the county harvest *more* than 30 acres of crops per farm, and only 291 farmers total have more than 50 acres of crops apiece. The bulk of the harvested acreage on a per farm basis is thus 29 acres or less, and 1156 farms, over 36 per cent of the total number in the county, possess nine acres or less of crops. Statistically it is obviously impossible for four-fifths of all farms to produce tobacco without "forcing" the acreage into the very small size groups, both as to total acreage per farm and harvested acreage per farm. The statistics merely help to substantiate the observable fact of the importance of the tobacco patch (the regional term for the small tobacco field) to the small landholder, be he owner, tenant, or share-cropper.

Field work in the Cove Creek area of mountainous Watauga County, North Carolina, has disclosed that many 20 to 30 acre farms high on the slopes of the mountains raise from three-tenths to five-tenths of an acre of tobacco, this acreage being the most important on the farm, and often constituting ten to fifteen per cent of the entire cultivated acreage on each landholding (Figs. 8 and 9). Farther down the slopes, on slightly larger farms, averaging 50 acres in size, and containing some bottom alluvial land, the average burley patch in the Cove Creek section is eight-tenths of an acre, and from 15 to 20 acres per farm are under cultivation. On larger bottomland farms, 60 to 70 acres in size, an acre to an acre and a quarter of tobacco may be cultivated, but this larger patch occupies a lower proportion of the cultivated acreage of these better farms than the small patches do of the upland farms. Within this one large "cove" at the headwaters of the Watauga River (tributary to the Ten-

nessee), and just across the ridges from the headwaters of the New (tributary via West Virginia to the Ohio) and the Atlantic drainage, the acreage of burley tobacco has increased from 20 in 1930 to 383 in 1940 and 788 in 1945. Nearly all of this increase, obviously, has occurred since the institution of "control programs," and the rapid expansion of the tobacco crop reflects the need of the mountain farmers for an intensive cash crop, yielding a high return per unit of area on small landholdings. Some of the intensively cultivated tobacco patches yield as much as 1625 pounds of burley per acre. Other crops, similar in return, grown in the Cove Creek area are cabbages and green beans.

Correlation of the Main Tobacco Area with Farm Size

The main burley acreage of the Mountain South lies northeast and east of Knoxville, and extends in Tennessee to the northeastern corner of the state. In Virginia the main area includes the three counties of the extreme western tip of the state, and in North Carolina the area north of Asheville to the Tennessee state line is included. Although in three states, the overall area is contiguous, and is entirely enclosed by the isarithm of 70 per cent of all farms engaged in tobacco culture (Fig. 4). Greene County, Tennessee is the nuclear core of the tobacco area, contains the greatest total acreage (partly because of size), and is the heart of the marketing area. Many warehouses elsewhere, as at Asheville and Abingdon, are owned by Greeneville interests. In 1944 a total of 4754 separate farms, 77.2 per cent of all farms, in Greene County grew tobacco (Fig. 23), and the University of Tennessee Tobacco Experiment Station of 511 acres is located within its borders. Hamblen County, a small county west of Greene, actually contains

FIG. 23. A representative older tenant farmhouse of an Upper East Tennessee tobacco farm. This house, occupied by Maulty Jones, is on the banks of the Nolichucky River in Greene County.

a greater proportion of tobacco with respect to total area, and three northeastern Tennessee counties (Claiborne, Hancock, Johnson) and one North Carolina county (Madison) exceed Greene in percentage of farms engaged in tobacco culture, three of these four having 80 per cent or more of their farms growing tobacco, with the top figure 86.8 per cent in Hancock County, a Tennessee county on the Virginia line fifteen miles east of Cumberland Gap. Madison County, North Carolina, is adjacent to and immediately south of Greene County, Tennessee.

The Upper East Tennessee tobacco area is a region wherein farm sizes average from 40 to 60 acres. The 6155 farms of Greene County average 52.7 acres in size, the 2906 farms of Madison County, North Carolina, average 59.6 acres, and the farms of all other parts of the region average much the same, or even lower in acreage (Table IV). However, as previously explained, averages usually mean less in this rough countryside than do acreages of harvested crops per farm, and these are uniformly low. The "big farmer" of the region owns 100 acres of land, and harvests 50 or more acres of crops. The usual farmer has a lower base, and is forced to depend

upon (1) intensive tobacco culture or (2) part-time farming, with the earning of supplementary income in the farm woodlot, mountain forests, or industry. Many small tobacco cultivators are, in effect, part-time farmers.

The culture of tobacco within this area of small farms is practically a necessity. Expansion of the burley acreage has continued with farm subdivision, with many new farms engaging in the cultivation yearly, and with the regional tobacco acreage thus increasing despite overall acreage controls. Although tobacco culture was not introduced originally *because* the landholdings were small, it has flourished in part because of the existence of small farms and continuance of subdivision of these farms.

Comparison with the Situation in Lower East Tennessee

Tobacco culture has spread from Upper East Tennessee into Lower East Tennessee, between Knoxville and Chattanooga (Fig. 2). The total tobacco acreage in Lower East Tennessee is much less, and there are no warehouse and auction facilities closer than Knoxville, on the border between the two regions. (Note: During the 1949–1950 marketing season two new warehouses were opened at Athens and Sweetwater. These are the first tobacco warehouses in Lower East Tennessee, and reflect the increasing tobacco acreage of this region.) The change in emphasis on tobacco occurs at Knoxville, and correlates with a marked and sudden change in average size of farm and average acreage of harvested crops per farm. Southwest of the city, landholdings average from 60 to 120 acres in size all the way to the Georgia and Alabama state lines (Fig. 6 and Table IV). The farms are uniformly larger than they are northeast of Knoxville, on the average they contain more arable land, and the country is in general of higher agricultural quality than Upper East Tennessee, is less rough, and the "folded mountain ridge" almost disappears; this is the true Great Valley of East Tennessee. There is a broader base per farm for field crops, these, however, being the same crops as in Upper East Tennessee, because nearly all of the area except the first tier of counties north of the Georgia line are beyond the limits of the Cotton Belt. Although the tobacco acreage of Lower East Tennessee has increased during the last twenty years (see historical section), it is of less general interest to the farm operators than it is to those of the hilly northeastern portion of the state. Farms are larger, less broken and hilly, and more mechanized, in part no doubt a relationship to size alone but in part

TABLE IV

AVERAGE SIZE OF FARM IN ACRES, SELECTED TOBACCO COUNTIES

County	*1930*	*1940*	*1945*
Southwestern Virginia, Western North Carolina			
Lee (Va.)	75.6	55.2	59.3
Scott (Va.)	67.2	64.6	71.2
Washington (Va.)	71.9	68.6	70.1
Haywood (N. C.)	75.4	50.9	54.7
Madison (N. C.)	62.3	57.8	59.6
Watauga (N. C.)	68.7	59.6	63.7
Upper East Tennessee			
Carter	48.0	37.9	33.0
Claiborne	56.4	55.6	49.9
Cocke	72.8	57.9	59.6
Greene	65.0	60.2	52.7
Hamblen	68.8	56.3	50.0
Hancock	73.0	72.7	70.0
Hawkins	73.8	67.1	66.6
Jefferson	80.1	81.0	75.8
Sevier	76.8	65.0	68.4
Sullivan	65.4	51.3	46.4
Washington	57.0	53.7	44.2
Lower East Tennessee			
Bradley	102.0	100.6	104.9
Loudon	98.1	99.2	91.3
McMinn	93.1	78.1	89.2
Monroe	81.6	92.2	98.2

owing to more favorable terrain. The owner of power equipment prefers to use it on field crops, and not to engage in the cultivation of "tobacco patches." Small farmers, especially in McMinn and Monroe Counties, with more hand labor and less machinery available, have, however, turned to tobacco culture, and enthusiasts, some of whom have moved to the area from Upper East Tennessee, are ardently promoting its cultivation.

The owner or tenant of a "large farm" is less likely to be interested in engaging in tobacco culture (in a region to which the crop is spreading) than is a small farmer. Lower East Tennessee, as a *region* possessing "large" farms, has thus a certain inertia to overcome. One acre of tobacco out of 60 to 80 cultivated acres per farm is of less importance to the operator than one acre of tobacco out of 29 cultivated acres is to the "average" operator of Upper East Tennessee. There is less urge, as a result, to seek a tobacco quota on the larger farms than there is on the small farms of northeastern Tennessee, mountainous North Carolina, and rough southwestern Virginia. Subdivision of farms has not been carried on to the degree that "morcellement" has occurred in the northeast. For example Bradley County, east of Chattanooga, does not have any farms under three acres in size, has only 100 in the three to nine acre group, and possesses 637 farms of 100 acres and over in size. By percentage, nearly 40 per cent of all Bradley County farms are landholdings of 100 acres or more, one-third of McMinn and Loudon County farms are in this size group, 37 per cent of Monroe County farms, and the grouping is significant throughout Lower East Tennessee; in contrast, in Upper East Tennessee, only 14 per cent of all Greene County farms are 100 acres or over, only 6 per cent of Carter County farms, 19.6 per cent of Hawkins, 11.6 per cent of Claiborne, and 17.4 per cent of the farms of Madison County, North Carolina are in this larger size group. As the farms become smaller from Knoxville northeastward, in both *total acreage* and *harvested acreage* per farm, tobacco *increases* in both relative and absolute importance; as the farms become larger southwest of Knoxville, in both *total acreage* and *harvested acreage* per farm, tobacco *decreases* in both relative and absolute importance. The decrease in importance southwest of Knoxville is both the result of (1) a later start in the industry and (2) owing to the presence of larger landholdings, although these, like those of Upper East Tennessee, are all family sized farms, and family-operated farms.

SUMMARY

The cultivation of burley tobacco is of relatively recent origin in East Tennessee, southwestern Virginia, and western North Carolina, and the great growth of the industry has occurred since the days of World War I. Tobacco cultivation is almost a necessity upon the small farms of the Mountain South, and tobacco is relatively more important as a cash crop to the small landholder than it is to the "large" farmer. The presence of small farms in Upper East Tennessee, southwestern Virginia, and in mountainous western North Carolina near the originally established burley area of Greene County, Tennessee, has been a factor in the rapid expansion of the regional culture of burley tobacco, and the southwestern margin of the region of intensive tobacco cultivation correlates with the general limit of small landholdings. The tobacco industry is still expanding within Upper East Tennessee, and tobacco culture is spreading to small farms in Lower East Tennessee.

SOYBEANS IN THE LOWER MISSISSIPPI VALLEY

Merle C. Prunty, Jr.

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ONE of the more striking changes in the agricultural geography of the lower Mississippi valley during the past 20 years has been rapid increases in soybean cultivation. During the past decade the soybean has become a major cash crop in the lower Mississippi region. The valley now ranks as the second largest soybean producing district in the nation, though not nearly so large a producer as the Illinois-Indiana-Ohio region. While increments in soybeans planted and harvested in this region are phases of the rise of the soybean in many segments of United States agriculture, they are especially noteworthy here because of the rapidity of their occurrence, their present volume, and the economic conditions and land occupance practices which engendered them.

In 1939, Illinois supported 2,647,000 acres planted to soybeans and produced 44,772,000 bushels. In the same year, the tri-state district surrounding the panhandle of Southeastern Missouri and including portions of Missouri, Kentucky, Arkansas, and Tennessee, contained 960,351 acres planted to soybeans and produced 888,894 bushels (Fig. 1). By 1944 Illinois production of the bean had increased to 3,832,646 acres grown, and a harvest of 73,335,737 bushels. In the same year, however, soybean production in the tri-state district occupied 962,934 acres (or virtually the same acreage in 1939) but the harvest had increased *more than 900 per cent*, to 8,075,579 bushels. (This figure includes only those areas indicated on Figure 1 with more than 15 per cent of cropland harvested planted to soybeans.) The largest producing district in both volume harvested and acreage planted is, of course, the east-central Illinois–central Indiana–western Ohio district and the Mississippi valley does not even closely rival it. Soybeans are important in central and northern Iowa as a cash and manure crop, and in the coastal plains segments of east central and extreme northeastern North Carolina, and southeastern Virginia. In the Atlantic Coastal Plain belt the bean is cultivated primarily as a feed, fodder, and manure crop and only occasionally for cash sale of the beans. At present soybeans are being grown in small amounts in many districts in the Southeastern states and the total acreage planted, as well as volume of beans harvested, appears to be increasing rapidly. However, production for cash sale is characteristic primarily in the lower Mississippi valley.

This discussion will attempt to (1) describe factors underlying the rapid rise of soybean acreages in the lower Mississippi valley, (2) analyze changes in areal distribution of soybean acreages and production in the region since 1939, (3) explain the bases of these changes,

especially as they relate to economic conditions and modifications in land occupance practices formerly characteristic of the new soybean belt, and (4) survey current trends affecting soybeans in the new belt.

The lower Mississippi valley has been and is primarily a cotton producing area; though the soybean constitutes a new modifying factor in the region, its use in most instances is a consequence of or related to changes in conditions underlying commercial cotton farming. Only in 1946 and 1947, in any district in the lower Mississippi area, has acreage planted to soybeans been larger than acreage planted to cotton. The 1946–47 anomaly was not planned by land operators; some acreages originally planted to cotton failed to develop satisfactory stands due to a damp, cool spring, and soybeans were planted to replace the cotton. The areas affected included southeastern Missouri, northeastern Arkansas and western Tennessee. Throughout the lower Mississippi area corn, of course, retains its traditional position as the leading crop in acreage planted.

Throughout the discussion it should be remembered that the soybean is used as an oilseed cash crop, as a green manure crop, for hay and fodder, as a supplemental forage crop interplanted with corn, and as a legume-nitrogen source for corn.

When grown with corn for supplemental forage, corn ears are gathered before livestock are turned into the fields then cattle and hogs forage on corn stover, mature soybeans, and remains of the soybean plant itself. When grown as an oilseed crop for harvest the beans frequently are drilled in double rows about 6 inches apart, which in turn are spaced from 32 to 40 inches from the next double-row planting. If so planted, rows can be cultivated with corn-cultivation equipment mounted on tractors, and yields are claimed to be higher than from the more common single-row plantings. Although the practice is decreasing, it has been common throughout the region to plant soybeans broadcast or with wheat drills from which the seed plates have been removed. This system has the advantage of eliminating cultivation entirely, but is decreasing as experience demonstrates that increased yields from row-type plantings justify the added cost of cultivation.

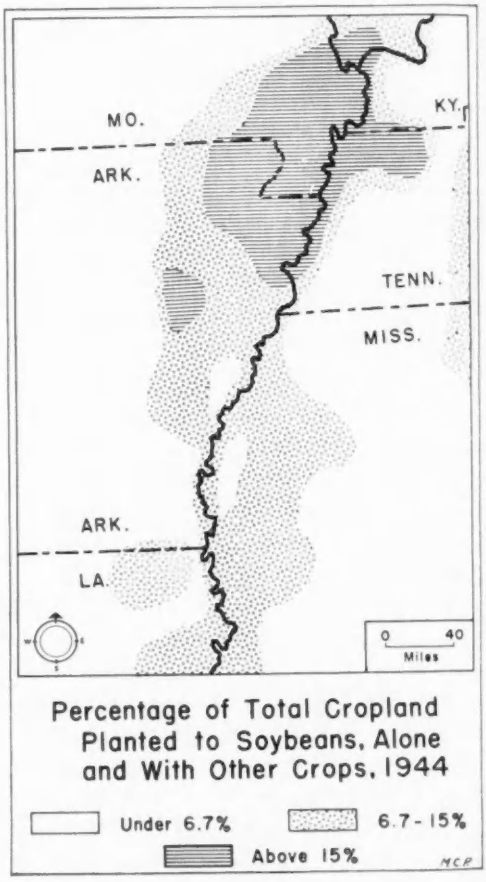


FIG. 1. Soybeans in the lower Mississippi valley. Note the primary concentration in the "tri-state" district surrounding the panhandle of southeastern Missouri; a secondary, smaller, area of heavy soybean production exists in the lower White River valley of east-central Arkansas. (Based on data from 1945 Census of Agriculture.)

When used for green manure, soybeans are sown broadcast or drilled; their big leaves and rapid growth provide a large quantity of organic debris. When turned under in early fall, soybeans frequently are followed by plantings of oats, or crimson clover, or both crops interplanted. Use of the soybean as a green manure crop is disappearing rapidly since its summer growth period does not fit the cycle of farming and labor requirements as satisfactorily for manure purposes as do legumes with winter growth characteristics. As a hay fodder crop the soybean frequently is grown alone and cut and cured before the beans ripen; the laxative effect of mature beans upon livestock is thereby reduced and weight losses during initial winter feeding periods for livestock avoided. Though relatively higher in protein content (in proportion by dry weight) than either corn on the stalk or whole ear corn including shuck and cob, soybean hay does not rival such legumes as crimson clover, alsike, ladino clover, Korean lespedeza, or alfalfa in protein content and palatability. Use of soybean hay is decreasing rapidly except in the Yazoo Basin of northwestern Mississippi, the Arkansas River valley, and northern Louisiana. Throughout the Mississippi-Louisiana sectors of the valley soybeans frequently are interplanted with lespedeza, timothy, or orchard grass when grown for hay.

CULTIVATION PRIOR TO 1940

In the post-World War I decade the soybean was a negligible factor in the lower Mississippi valley. It was not until after its value had been demonstrated in the Corn Belt that it received significant attention in southern areas. During the 1929–1939 decade, production of soybeans for the nation as a whole increased more than 900 per cent, but this increase in beans harvested occurred virtually entirely outside the lower Mississippi valley. As farmers of the Corn Belt turned to the soybean as a profitable cash crop, land operators of the lower Mississippi valley recognized its value as a manure, forage, and hay crop, and also as a valuable source of supplemental nitrogen when grown with corn. In other words, the Mississippi valley region lagged about a decade behind the Corn Belt in recognizing the multifunctional character of the bean, about a decade behind in putting it to work as a forage, hay, and supplemental crop and, as will be indicated later, about a decade behind in converting to production of the bean as a cash oilseed crop.

The agencies principally responsible for introduction of the soybean into the lower Mississippi valley during the 1929–39 decade appear to have been the Soil Conservation Service and Agricultural Adjustment Administration. As cotton acreages were reduced under the Agricultural Adjustment Act, and as incentives for soil building were established through the Soil Conservation Service, land operators turned to the soybean and other crops to replace cotton and collect Federal subsidies for soil improvement programs. Many farmers in the region first heard of the soybean during the 1933–35 period from Soil Conservation Service and other Department of Agriculture representatives.

Between 1933 and 1940, the soybean was cultivated in virtually every segment of the lower Mississippi valley and was tested by land operators for oilseed production as well as for other uses. The increase in soybeans in Mississippi County, Arkansas, from 1929 to 1939 is crudely representative of what happened throughout the region (Table I). It became apparent as early

as 1937 that the soybean was a poor producer of oilseed in many segments of the lower valley, and that seed production was profitable in only selected localities. Prior to 1940 virtually all soybean seed used in the lower valley was imported from Illinois, or consisted of locally seed derived from Illinois strains, especially the Lincoln variety. The Lincoln bean commonly yielded only 8 or 10 bushels per acre except in favorable districts, and frequently failed to produce if subjected to a late summer drought. However, the plant grew luxuriantly even though seed yields were low and by 1939 was firmly established throughout the lower valley as a hay, forage, green manure, and supplemental nitrogen crop interplanted with corn (Fig. 2).

By 1939 marked concentration in soybean acreages within the lower Mississippi valley were noticeable. Especially noteworthy were the St. Francis, Black River, White River, and Arkansas River valleys in Arkansas, alluvial

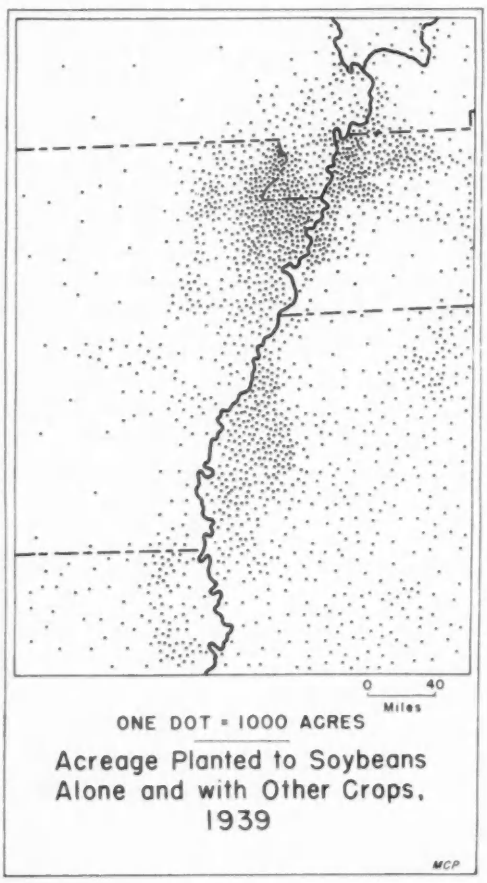


FIG. 2 (left). Acreage planted to soybeans grown alone and with other crops, 1939, in the lower Mississippi valley. Though concentration of cultivation within the alluvial valley was marked by 1939, the soybean was planted in numerous upland localities, especially in Mississippi and West Tennessee. (Based on data from 1940 Census of Agriculture.)

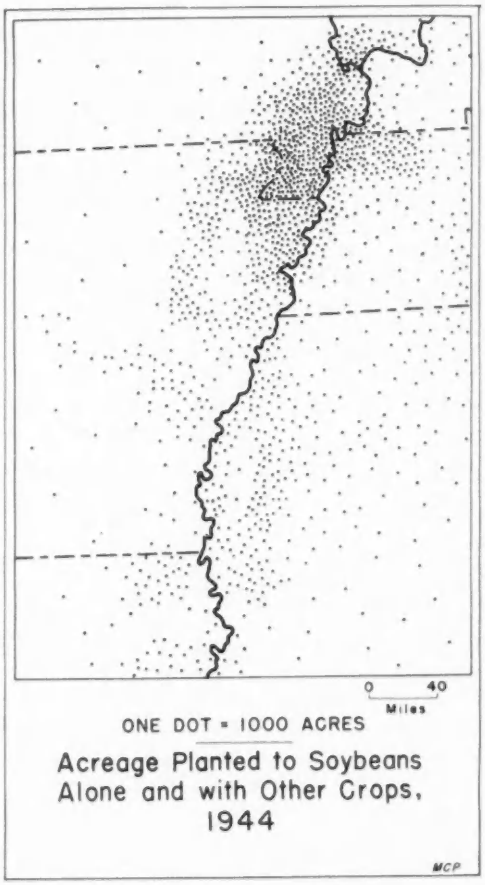


FIG. 3 (right). Acreage planted to soybeans grown alone and with other crops, 1944, in the lower Mississippi valley. Comparison with Figure 2 reveals an increase in plantings in the alluvial Mississippi valley, and a decrease in acreages cultivated in adjacent upland districts. The total acreage planted to soybeans did not change materially from 1939 to 1944. (Based on data from 1945 Census of Agriculture.)

lowlands of the Mississippi floodplain in the Missouri "panhandle," western Tennessee and Kentucky, eastern Arkansas, the Forked Deer and Obion River valleys in northwest Tennessee, Yazoo Basin–Mississippi floodplain in northwest Mississippi, and the valleys of the Ouachita and Boeuf Rivers in northeast Louisiana (Fig. 2). Somewhat less dense concentrations existed on loessial soils of upland western Tennessee, in the lower valley of the Tennessee River, and in the northern segment of the Alabama–Mississippi Black Belt in northeast Mississippi.

Distribution of soybean cultivation in 1939 bears out a point which now has strong limiting effects upon dissemination of oilbean production into many southern areas outside the Mississippi valley. Analysis of 1939 distribution indicates that most of the crop was concentrated upon alluvial soils of the Sharkey-Sarpy-Yazoo-Crowley-Miller-Portland series; these are floodplain soils of the lower Mississippi valley. Second to the floodplain soils as favorites for soybean production are terrace soils —the Calhoun-Olivier-Richland series in particular. The key factor is that throughout the lower Mississippi valley a late summer drought of two or three weeks duration can be expected, about three years out of four, between mid-July and early September. Frequently this drought period occurs when corn is tasseling and of course severely limits corn yields. This also is the period when soybean seed is forming. If insufficient moisture is available, the soybean sheds its seed, or seed fails to form. However, since moisture availability is a physiologic and edaphic factor as well as a climatologic and statistical one, soybeans cultivated on floodplain and terrace soils have advantages of reduced runoff due to decreased slope, higher percentages of clay fractions in both topsoil and subsoil, and in general a greater proportion of organic material within the soil than can be found in nearby non-floodplain and non-terrace soils. Moisture retention capacity is superior in the alluvial soils, soybean shedding is much less, and yields are higher. With progres-

TABLE 1

SOYBEAN PRODUCTION FOR SELECTED COUNTIES, 1929–1944*

	1929	1934	1939	1944
CHAMPAIGN CO., ILL.:				
Soybean grown alone, acres	21,584	76,135	158,337	187,363
Soybean grown with other crops, acres	1,415	16	(a)	(a)
Soybeans harvested for beans, bushels	(a)	1,478,285	3,198,285	4,317,018
NEW MADRID CO., MO.: (b)				
Soybeans grown alone, acres	4,446	4,648	14,972	66,970
Soybeans grown with other crops, acres	2,439	2,443	11,574	2,894
Soybeans harvested for beans, bushels	(a)	12,524	62,649	1,263,673
MISSISSIPPI CO., ARK.: (b)				
Soybeans grown alone, acres	657	7,352	24,962	54,950
Soybeans grown with other crops, acres	2,270	19,750	71,468	20,115
Soybeans harvested for beans, bushels	(a)	56,899	319,092	1,298,665
TIPTON CO., TENN.: (b)				
Soybeans grown alone, acres	752	2,312	9,080	7,610
Soybeans grown with other crops, acres	924	3,321	20,232	1,832
Soybeans harvested for beans, bushels	(a)	5,764	16,128	15,963
SUNFLOWER CO., MISS.: (b)				
Soybeans grown alone, acres	4,102	23,743	28,445	19,262
Soybeans grown with other crops, acres	532	3,623	5,634	2,471
Soybeans harvested for beans, bushels	(a)	1,601	6,391	38,199

*After U. S. Census of Agriculture, 1930, 1935, 1940, 1945.

(a) Data not available.

(b) Location of New Madrid, Mississippi, Tipton, and Sunflower Counties indicated on Figure 5 by numerals 1, 2, 3, and 4 respectively.

sively greater emphasis on oilseed for commercial sale throughout the region, soil moisture has become a major factor influencing relative distribution of production.

Even in a year when there is no appreciable late summer dry period the superior character of the alluvial soils for oilseed production is reflected in relatively higher yields than obtained from upland soils. Autumn in the lower valley characteristically is the driest quarter of the year but it is during this period, up until about the first week in October, that bean pods are "filling out." Superior moisture factors of the alluvial soils appear to enable more "filling out" of beans planted on them. Although the relationship presently is obscure, there may be a rather close correlation between percentage of clay fractions in gumbotil subsoils of the Illinois plains and in Mississippi alluvial soils which, when balanced against evaporation—transpiration indices would permit delimitation of those United States regions capable of economic oilbean production using present commercial bean varieties.

CHANGES IN PRODUCTION, 1939–1944

Since 1939 soybean production in the lower Mississippi valley has undergone marked changes in relative areal distribution, in purposes for which soybeans are cultivated, in marketing, and in methods of planting, cultivating, and harvesting. Previously insignificant as a cash crop, since 1939 the soybean has ranked second to cotton as a cash income source in the upper segment of the Mississippi embayment (Fig. 1).

Comparison of Figures 2 and 3 indicates areal shifts in total acreage planted to soybeans during the five year period 1939–44, but little change in total acreage within the region as a whole. While soybean cultivation decreased on uplands of central and northeast Mississippi, in the loess plains of west Tennessee and Kentucky, and in north-central Louisiana, acreage planted increased especially in northern sectors of the alluvial valley. The relative acreage increase is particularly striking in southeast Missouri where today is found the heaviest concentration of acres planted and largest per-acre yields of beans grown for cash sale. Increases in acreages on alluvial soils of the region apparently are consequences of greater moisture retention capacity in these soils, a factor progressively more significant as the shift to commercial bean production occurred (Figs. 4 and 8).

Decreases in acreages planted to soybeans grown for all purposes were greatest in uplands of central Mississippi and west Tennessee, areas not well suited to production of the bean for cash sale (Figs. 5 and 7). Also noteworthy were acreage decreases in the Yazoo Basin and in the Crowley's Ridge–St. Francis Basin of northeast Arkansas. These decreases in total acreage have one common cause in both areas: wartime lifting of cotton acreage limitations whereby both areas were permitted to increase cultivated land planted to cotton. In the Yazoo Basin another factor also has contributed—varieties of oilbeans were not available which produced abundantly in this and adjacent districts.

Explanations for 1939–1944 decreases in soybeans grown interplanted with other crops are more complex (Fig. 7). In the alluvial lowlands in west Tennessee, west Kentucky and northeast Arkansas, and in the Black and White River valleys of Arkansas, causes were fairly simple: increased wartime cotton acreages, and vastly increased acreages of beans grown alone for cash sale (Figs. 6 and 8). But decreases in total acreages outside the alluvial valley in uplands of

west Tennessee and central Mississippi resulted from many circumstances. The following are at least some causes: (1) increased cotton acreages, (2) substitution of more palatable hays, such as ladino, crimson clover, alsike, Korean lespedeza, and others, for soybeans, (3) use of winter legumes and small grains for green manure crops, (4) increased number of mechanical corn pickers—especially in west Tennessee—which do not satisfactorily harvest corn if beans are interplanted, (5) higher prices for corn—throughout the lower valley during war years many farmers omitted culture of soybeans in corn because a larger yield can be obtained for a few years if corn is planted alone, and (6) labor shortages which limited and in some areas reduced total cropland despite high wartime prices. In these areas soybeans were dropped as a standard

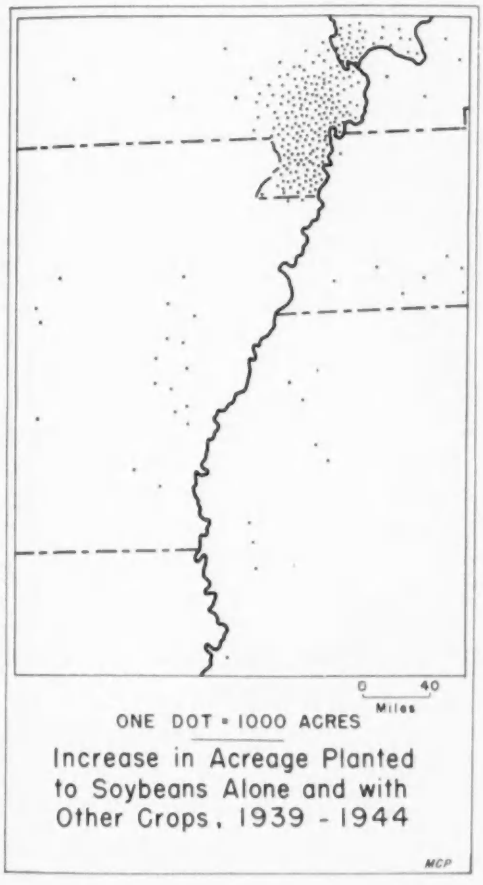


FIG. 4 (left). Increase in acreage planted to soybeans grown alone and with other crops, 1939–1944, in the lower Mississippi valley. During the five-year period represented, the only important increases in cultivation of soybeans for all purposes occurred in southeastern Missouri and southern Illinois. Increases shown are virtually all consequences of soybean cultivation for cash sale as oilbeans. (Based on data from 1940 and 1945 Censuses of Agriculture.)

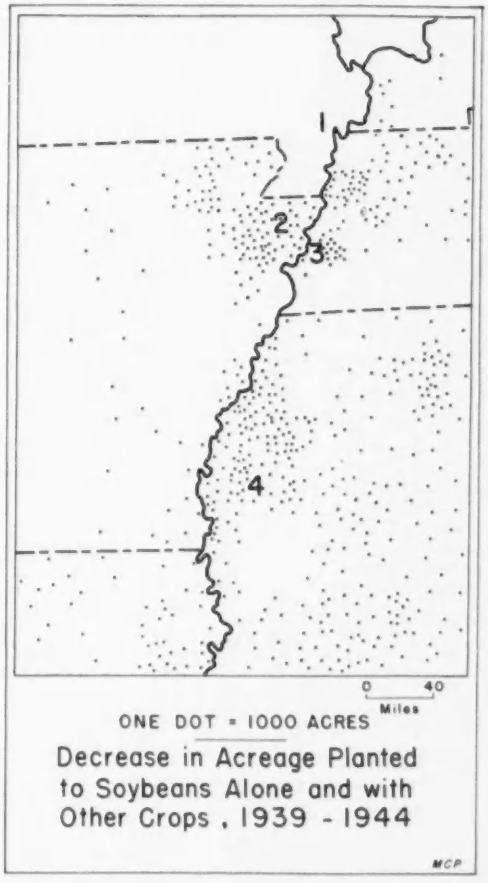


FIG. 5 (right). Decreases in acreage planted to soybeans, grown alone and with other crops, 1939–1944, in the lower Mississippi valley. In proportion to total acreages planted in 1939, greatest decrease occurred in upland western Tennessee and central Mississippi; however, greatest *actual* decreases in acreages planted were experienced in the Yazoo Basin and the upper White and St. Francis River valleys. Numerals 1, 2, 3, and 4 refer to sample counties whose production of soybeans is tabulated in Table 1. (Based on data from 1940 and 1945 Censuses of Agriculture.)

crop in order to concentrate labor on the highest unit-value crop which was, of course, cotton.

But of all changes in soybean cultivation in the region since 1939, most striking was the marked increase in production of oilbeans. In the tri-state district of the Missouri "panhandle" (western Tennessee, eastern Arkansas, southeastern Missouri) the basis for decreases in acreages planted to soybeans grown with other crops (Fig. 7) is revealed by increased acreages planted to soybeans in the Missouri "panhandle" (Fig. 4), and by increased acreages planted to soybeans alone throughout the entire tri-state district (Fig. 6). Comparison of Figures 4 and 6 indicates that increased acreages in soybeans planted for all purposes in southeastern Missouri (Fig. 4) were consequences of the planting of beans for commercial sale (Figs. 6 and 8.) The total decrease in plantings harvested for beans alone 1939–44, amounting to about 20,000 bushels for the entire valley, was so insignificant that it may be disregarded. Acreages planted to soybeans grown with other crops, 1939–1944, underwent a small increase in outer margins of the Missouri panhandle and in the Ohio-Mississippi floodplains of southern Illinois.

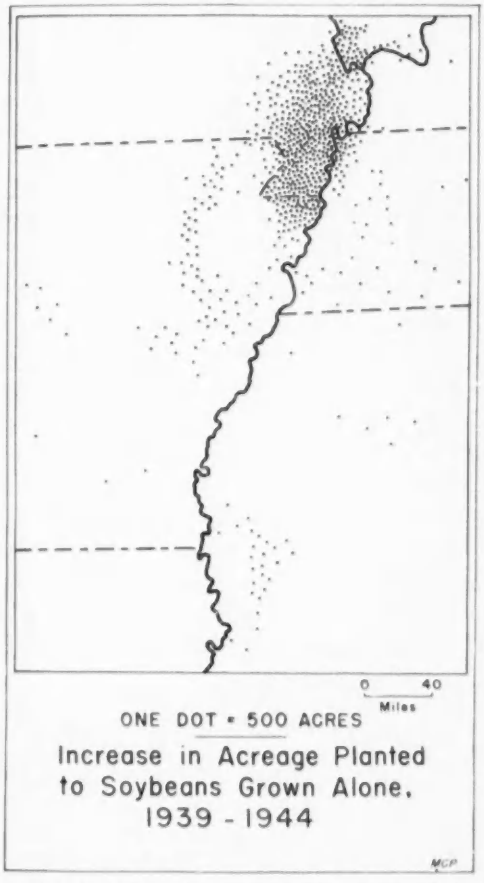
The factors responsible for the remarkable increase in oilbean production between 1939 and 1944 in the alluvial valley are varied but interrelated (Fig. 8). Between 1935 and 1940 agricultural experiment stations in Missouri, Arkansas, and Tennessee, and some private concerns developed varieties of oilbeans adapted to local conditions in the tri-state district. Particularly noteworthy are the Ogden (the largest producer both in volume and in acreage planted), and the Arksoy, the Volstate —all varieties improved by state experiment stations—and the Gaco, a variety developed by the Gideon and Anderson Land Co. of Gideon, Mo. A newer variety, the Roysoy, is gaining favor in the Missouri panhandle. The new varieties in most cases tripled yields obtained from the old Illinois varieties, and also increased the reliability of yields.

Partially as a consequence of new varieties, volume and acreages planted increased moderately in the tri-state district between 1939 and 1942. Cotton acreage limitations of the Production and Marketing Administration continued until 1942, and with higher yields guaranteed by the new beans substantial profits induced many land operators to increase bean plantings. But the major shift to oilbean production began as late as 1943, when, under powers given him by agricultural price support legislation, the Secretary of Agriculture had established a parity price for soybeans. Undoubtedly this was done in order to increase the national supply of vegetable oils during wartime. The result in 1933 was a rise of more than 50 per cent in the price of harvested oilbeans and a huge acreage increase. In 1944 and 1945 prices volume and acreages continued to increase. During 1945 and 1946 prices ran higher than $4.00 per bushel for top-grade beans.

Other factors also contributed to the shift to commercial bean production. Sharecrop and tenancy land tenure systems still predominate in the alluvial lowlands of the tri-state district, and cotton is the key crop. In part the tenancy and share crop system of the lower Mississippi valley is based on high cotton per-acre yields. For the thirty counties of the tri-state district the average per-acre yield of cotton lint in 1944 was 467 pounds. Eight counties in the district produced, per acre, more than 500 pounds of lint cotton. No

other non-irrigated cotton district in the United States produces such yields. These yields were obtained from large acreages, furthermore, and not from a specialty "fringe." Cotton was planted to more than 20 per cent of the cropland harvested throughout the tri-state district in 1944 and, for example, occupied 33.6 per cent in New Madrid County, Missouri, or 31.03 per cent of total cropland (Table I).

Integral in the share crop system based on cotton is control of marketing whereby the land owner is guaranteed receipt of his rent. Duplicate receipts and countersigned checks issued at the cotton gin insure the rental share. Landlords are reluctant to permit cultivation of any share-crop in an area where tenancy is high unless marketing of the product is performed in a manner which guarantees their share. For this



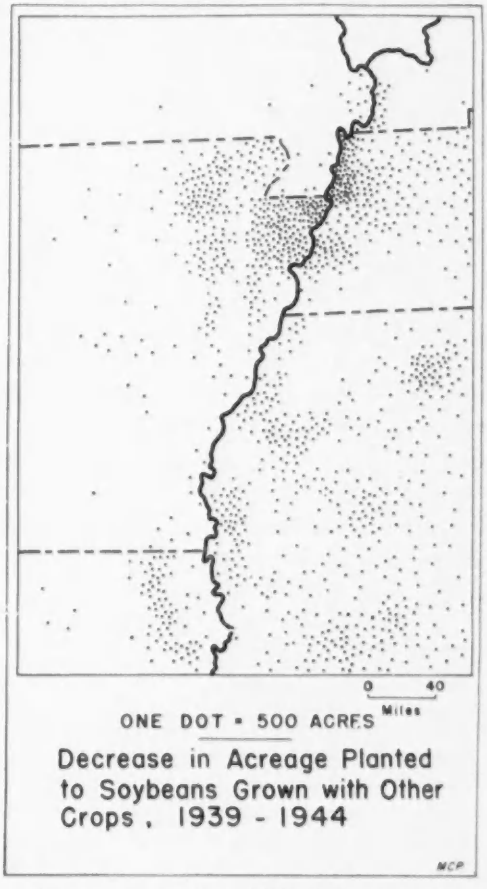


FIG. 6 (left). Increase in acreage planted to soybeans grown alone, 1939–1944, in the lower Mississippi valley. Increases shown in the tri-state district and the alluvial valleys of Arkansas partially explain increased concentration of soybean cultivation in these districts as shown on Figure 3. (Based on data from 1940 and 1945 Censuses of Agriculture.)

FIG. 7 (right). Decrease in acreage planted to soybeans grown with other crops, 1939–1944, in the lower Mississippi valley. Decreases shown are explained partially by increases in soybeans grown alone as indicated by Figure 6, by increases in cultivation of soybeans for all purposes as shown by Figure 4, and by increases in soybeans harvested for beans, as indicated by Figure 8. Outside of the alluvial valley, virtually all of the decreases in acreages planted for all purposes as shown by Figure 5 were decreases in interplanted, manure or hay crop beans. Within the alluvial valley and especially in the tri-state district the decreases shown above were consequences of the shift from interplanted, manure and hay crop cultivation to production of oilbeans. (Based on data from 1940 and 1945 Censuses of Agriculture.)

reason corn is an attractive crop to the tenant but less desirable to a landlord, for much corn can be disposed of as feed, or as livestock, before the harvest is completed. There scarcely is any device whereby the amount of corn in a field can be measured accurately before harvesting begins.

Soybeans fit the tenancy marketing structure as satisfactorily as does cotton. Beans must be sold to a commission merchant, an oil mill, or to one of the large vegetable-oil processing companies. The soybean crop can be mortgaged in the same manner as cotton. Since havesting is accomplished quickly by machine methods using all-crop combines, it is easy to check total volume harvested and insure all parties concerned their just shares. The most common share arrangement gives the landlord one-third of the bean crop if the tenant provides all seed and machines, or two-thirds if the landlord supplies seed and all machinery. In either arrangement the tenant supplies all labor. Banks will advance loans for harvesting machinery or make crop loans, since marketing duplicates that of cotton with which they are familiar.

After removal of cotton acreage restrictions in 1942, cotton plantings in the tri-state district increased only modestly. Limiting acreages planted was labor supply available for cotton thinning and picking. This limitation existed and exists, although the majority of cultivated land was worked by tractors. But soybeans could be and frequently are planted later than cotton, are cultivated twice (seldom more) interspersed with tractor cultivation of cotton, and are harvested in a few days by means of all-crop combines. One man with tractor and combine can produce as much as 200 acres of beans in addition to his cotton depending upon size of his equipment. Harvesting usually is completed between first and second or second and third cotton pickings, thus utilizing farm labor which otherwise might not be fully employed. Wartime conditions intensified the limiting effects of labor, both in price and volume, and undoubtedly accelerated the trend toward oilbean production.

Because of shorter growing season and rapid early growth, the soybean is an excellent substitute crop in the event that cotton plantings fail to germinate, a doubly important characteristic in the tri-state district where there always is danger of spring floods as well as excessive spring rainfall.

There exists among share and tenant farmers of the tri-state district something of a social and economic hierarchy based upon use or ownership of mechanized farm equipment. Everybody wants to ride while at work, not behind mules, but on a tractor. At the bottom of the hierarchy today is the tenant with mule-drawn equipment; his soybeans must be custom-harvested by a neighbor who owns mechanized equipment. Next up the scale is the tenant who owns no machinery but who works on a completely mechanized farm. There appears to be a distinct relation between mechanization of owner-managed farms and quality and turnover of labor. The better laborers tend to migrate to mechanized farms and to stay there longer than on nonmechanized holdings. At the top of the hierarchy is the tenant who owns his own machinery; these individuals frequently own small farms, but prefer to cultivate large acreages on a share-rental or cash-rental basis. Usually they are in demand; landlords prefer them because of the industry and ability evinced by successful ownership and operation of machines. The typical machine-owning tenant is a man of some economic substance and does not fit the common literary portrayal of

the southern tenant farmer in any sense. Tenants and share-farmers, in other words, prefer to produce soybeans instead of corn or cotton because with machines work is easier, acreages handled are greater, incomes of the tenants are larger as consequence of greater acreages cultivated, and social and economic status improves thereby. It is difficult to determine to what extent these factors contributed to accelerated oilbean cultivation, but undoubtedly the contribution was substantial.

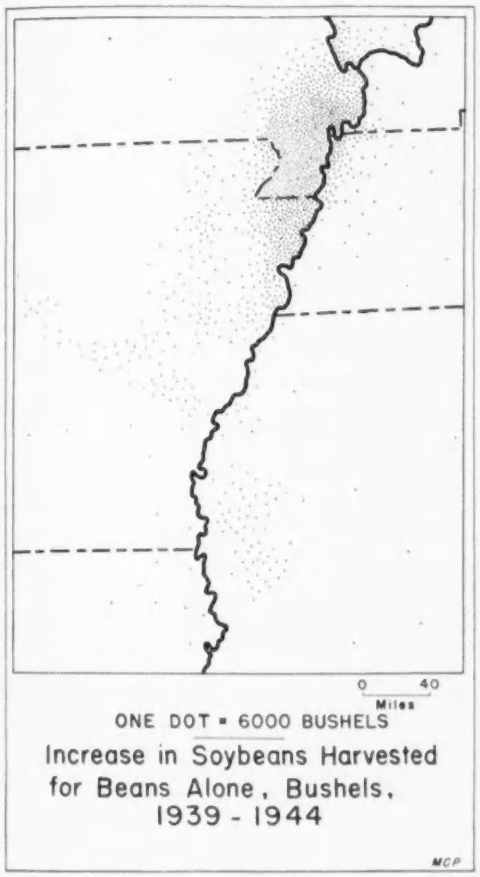


FIG. 8. Increase in soybeans harvested for beans alone, 1939–1944, in the lower Mississippi valley. Greatest increments occurred on alluvial soils of the tri-state district and also in the valleys of the Arkansas, White, Black, and St. Francis Rivers in Arkansas. There was virtually no decrease in oilbean production between 1939 and 1944. Production of soybeans harvested for beans alone for cash sale increased more than 900 per cent from 1939 to 1944 in the principal producing district—the tri-state area surrounding the southeastern Missouri panhandle. (Based on data from 1940 and 1945 Censuses of Agriculture.)

Per-acre net profits derived from soybeans in a typical operation represent a larger percentage of gross per acre-income than is the case with cotton. Assuming yields of 500 pounds lint cotton and 30 bushels of beans per acre, on typical 1946 prices the gross return from cotton was approximately $150.00 per acre, and from soybeans about $97.50 per acre. The landlord, receiving one-third rental share in either case, obviously prefers cotton for his income for it is roughly one-third greater. But the tenant, who bears production cost and the hard physical labor of cotton chopping and picking, views the situation differently. Seedbed and cultivation costs for either crop total (on 1946 prices) about $22.00 per acre. In the case of soybeans only harvesting costs—about $6.00 per acre—must be added, resulting in an approximate *net* of $69.00 per acre. However, cotton requires two "thinnings" or choppings, which average about $10.00 per acre, plus picking at $4.25 per hundredweight or $21.00 per acre, plus insecticides at approximately $5.00 per acre. Cotton frequently has to be replanted, increasing costs, and is not quite as reliable in the tri-state district as soybeans. Approximate net profit per acre from cotton in the area is $88.00. Since the tenant with mechanized equipment can handle three or four times more land planted to soybeans than to cotton, his preference for the bean is easily understood. An important factor retarding further expansion of soybean cultivation in the tri-state area at the expense of cotton is the preoccupation of landlords with cotton.

In 1944 acreage planted to soybeans in the tri-state district ranged from 4 to 8

per cent less in proportion of total cropland than that planted to cotton (Fig. 1). In New Madrid County, Missouri the percentage planted to soybeans was 27.28, to cotton 31.03 per cent (Table I).

TRENDS SINCE 1944

Rapid changes have been characteristic in the tri-state soybean district since 1944. From 1944 until 1947 soybean plantings increased substantially and in 1946–47 surpassed acreages planted to cotton in several counties of the Missouri panhandle and northeastern Arkansas. New Madrid County, Missouri, for example, produced 2,182,500 bushels of beans from 97,600 acres in 1946 (estimated), an acreage larger by about seven thousands than that planted to cotton. Total soybean production in the tri-state district exceeded 10,000,000 bushels in 1947 (estimated).

Per acre yields of soybeans appear to be increasing. This is due not only to an increased post-war labor force and better cultivation but also to improved oilbean varieties. Experimentation with varieties continues and still further increases in yields may be expected.

Very little fertilizer has been used in the tri-state district, even for cotton. On the typical farm virtually none is applied to beans, and seldom more than top-dressing of nitrate of soda to cotton. The leguminous nature of soybeans has led many operators to believe that the crop improves land instead of depleting it. While the soils of the alluvial lowlands are remarkable producers and far from exhausted, it is being recognized that the soybean is a heavy potash consumer. Fertilizer sales are increasing in the oilbean district.

Experiments are underway to develop oilbean varieties better adapted to climatic and edaphic conditions in middle and lower portions of the alluvial Mississippi valley. Experiment stations in Mississippi especially are interested and, tentatively, results are encouraging. Should varieties adapted to Yazoo Basin conditions become available it is reasonable to presume a boom in oilbean production in the next decade in that segment of the valley similar to what has transpired in the tri-state district during the past 10 years.

Mechanization of farm power is proceeding very rapidly throughout the lower Mississippi valley, and nowhere more rapidly than in the river counties of the tri-state district. Each new farm unit mechanized means additional acreage equipped to produce beans for cash sale and additional total oilbean production.

Since 1947 the trend toward increased oilbean acreages at the expense of cotton has been reversed. In the opinion of the writer this trend is a temporary one which in turn will be inverted by 1950 plantings. In the winter of 1947–48 it became apparent that cotton acreage limitations, lifted during the war, would be reimposed in the near future to curb accumulation of cotton surpluses. The Department of Agriculture has not yet said officially what base period would be used in setting cotton acreage allotments, but most landowners and operators assumed that the 1948 or 1949 period would be used and therefore expanded cotton acreages to the limit. Today in many areas of the alluvial valley there are cotton fields which cannot possibly be cultivated or picked in the 1949 autumn for, in area after area, plantings exceed harvesting capacity. Soybean acreages have been reduced accordingly. Once the cotton acreage allotment program is operating, presumably by 1950, major increases

in soybean plantings will occur unless the soybean too is subjected to acreage restrictions.

The Pace Farm Price Support Act (before Congress for action in the summer of 1949) includes an amendment whereby cottonseed prices will be supported at a level commensurate to that established for lint cotton. Limitation of cotton lint acreages will restrict the volume of cottonseed available. Limited cottonseed supply at higher prices undoubtedly will increase demand for oilbeans since beans are the other major domestic vegetable oil source.

Prior to 1944 more than half the oilbean crop of the tri-state district was shipped to oil mills in the Illinois-Indiana region. Decatur and Galena City, Illinois, and other Illinois-Ohio cities received huge shipments of southern beans. Today, however, the substantial majority of the crop is pressed in the producing district. New flotation oil mills have been erected at Cairo, Ill., Union City, Dyersburg, Tiptonville, Jackson, and Memphis, Tennessee. New dual-purpose ("conversion") oil mills are in operation at Sikeston, Kennett, and Portageville, Missouri and Wilson, Arkansas. Older oil mills of the "conversion" type continue in operation at Cairo, Ill., Tiptonville, Dyersburg, Trenton, Memphis, Jackson and Collierville, Tenn., and Forrest City, West Memphis, Wilson, Osceola, and Blytheville, Arkansas, and Sikeston, Mo. A "conversion" mill extracts oil from either soybeans or cottonseed by changing rollers on the presses to fit the seed being handled. Additional mills may be expected in the tri-state district as oilbean production increases and stabilizes after 1950.

There is at present virtually no production of edible soybean varieties in the lower Mississippi valley.

SUMMARY

Soybean cultivation became significant in the lower Mississippi valley during the first half of the 1930–1940 decade as a soil-building crop for manure, hay and forage, and interplanting purposes. Its introduction into the region was fostered largely by governmental agencies. Soybean production for oilbeans was insignificant during the 1930–1940 decade. Cultivation was widespread throughout the valley but within a few years marked areal concentrations became apparent as consequence of adjustment of soybean cultivation to superior edaphic conditions, especially soil moisture, on alluvial floodplains and terraces of the valley. Oilbean yields were low due to lack of varieties adapted to local conditions. Throughout the region the soybean did not remotely rival cotton as the dominant cash crop.

Between 1939 and 1944 areal distribution of soybean cultivation in the valley shifted greatly resulting in a new primary oilbean producing concentration in the tri-state district. The volume of oilbeans produced increased more than 900 per cent in the principal producing district and the lower Mississippi valley became the second-largest oilbean producing region in the nation. Supremacy of cotton as a cash-crop was threatened in the principal producing district—the tri-state area—which emerged with a modified landuse system involving a soybean-cotton cash-crop dualism adjusted to the share-crop and tenancy land tenure system.

These changes were the consequences of a variety of associated factors: (1) cotton acreage limitations under the A.A.A. until 1942 which permitted cash crop production of oilbeans to gain a toehold, (2) development of new oilbean varieties, highly reliable, which approxi-

mately tripled per-acre yields, (3) governmental price support for soybeans which increased the price of the oilbean more than 50 per cent, (4) wartime vegetable oil demand, (5) substantial amounts of farm power mechanization, especially in the tri-state district, (6) labor shortages during the war years which did not permit large expansion of cotton acreages, but did not affect soybean production since the crop is harvested by machine methods, (7) soybean cultivation was fitted into cultivation and harvesting of cotton without difficulty, providing fuller use of available labor, (8) soybean production fitted the share-crop and tenancy land tenure system of the principal (tri-state) producing district very well, (9) the cotton share-crop system, through its similarity to soybean share-cropping, aided in procuring cultivation loans to begin bean production and stabilized marketing by guaranteeing all participants their shares of profits, (10) the soybean could be substituted for cotton in event of failure of cotton plantings, (11) machine cultivation characteristic of soybean production appealed to tenant and share-crop operators, for larger acreages could be handled than with cotton, individual profits were greater, and socio-economic status improved thereby, and (12) net profits from soybean production were comparatively large as consequence of relatively small production cost per acre.

Since 1944 additional changes in soybean cultivation have occurred in the lower Mississippi valley but do not represent a major change in land use practices; instead these modifications represent solidification of patterns in land use established during the earlier period. Particularly noteworthy trends since 1944 include: (1) increased acreages planted to soybeans and increased oilbean production to a point where, in total acreages, the soybean closely rivals cotton, (2) increased fertilizer purchases, (3) increased farm mechanization, (4) local oil mills now consume the bulk of the Mississippi valley crop, and (5) new varieties are being developed which may extend the oilbean producing belt southward into the Yazoo Basin and northeastern Louisiana in the next decade. While the relationship of soybean production *vis-à-vis* cotton depends upon cotton acreage limitations and farm price supports established by the Department of Agriculture, it appears reasonably certain that soybean acreages will exceed those of cotton by 1950 and afterward unless the bean itself is severely limited. Production in the present primary district—the tri-state area—can be expected to continue to increase.

In conclusion, it should be noted that agencies of the Federal government with and without cooperation of state governments introduced soybeans into the lower Mississippi valley, developed the present high-yield varieties, provided incentives for soybean production through soil-improvement subsidies and limitations on cotton acreages, and furnished price-support for oilbeans at high levels. The Federal government's forthcoming cotton acreage limitation and price support program will provide further impetus to soybean cultivation. There has been enough governmental influence in the rapid rise of the Mississippi valley soybean area to delight the heart of any social determinist. Geographers, in measuring areal differences from region to region, in evaluating these differences to determine their fundamental causes, and in developing predictive values which may be applied to areal factors both chronologically and spatially, cannot afford to minimize the influences of political economics upon regional land use characteristics.

SALES AND SERVICE INDUSTRIES IN LUCE COUNTY, MICHIGAN

George F. Deasy

Dr. Deasy, Associate Professor of Geography at The Pennsylvania State College, is the author of several articles that appeared in earlier issues of this magazine. The October 1949 issue contained the latest of these, "The Tourist Industry in a 'North Woods' County."

WHILE considerable attention has been paid to the historical development and present status of primary industries such as lumbering, agriculture, and mining in the Upper Lakes States, relatively little has been written concerning the evolution and current characteristics of sales and service industries that in large degree have as their *raison d'etre* the supplying of various personal needs of local workers in the former fields. Among such secondary occupations are wholesale and retail merchandising, the professions and trades, and government activities. The sales and service industries of Luce County, a sparsely-populated area of over 900 square miles in the middle of the Upper Peninsula of Michigan (Fig. 1), have been selected for analysis as representative of conditions in the Upper Lakes States.

The main urban center of the county, Newberry, has a population of 2,465 and is located on the Duluth, South Shore, and Atlantic Railroad, midway between the eastern and western borders of the county (Fig. 2). Three other villages—McMillan, Dollarville, and Soo Junction—each with but a few score to several hundred people are spaced at intervals along the railroad. Two additional villages—Hunters Mill and Helmer—are located on the Tahquamenon River and Manistique Lake, respectively. The large State Hospital for the Insane, with a population about one-half that of Newberry, is situated two miles south of the town.

Farming is concentrated chiefly in the southern third of the county, while manufacturing (mainly wood products) is localized largely in Newberry. The central and northern parts of the region are only seasonally occupied by scattered hunters, an occasional lumbering outfit, transient blueberry pickers, and various government peoples (foresters, conservationists, etc.).

Early Establishments

In 1881, Luce County was virtually an unbroken wilderness, and stores and business offices were almost unknown. Small-scale lumbering operations in the far north, along the Lake Superior shore, may have supported one or more company stores to dispense produce imported by lake vessels, but scattered homesteaders in remaining parts of the county were practically self-sufficient. The railroad had just been completed across southern Luce County, but no settlements as yet had been established along the line.

Then, in early 1882, construction was begun on the Vulcan Furnace

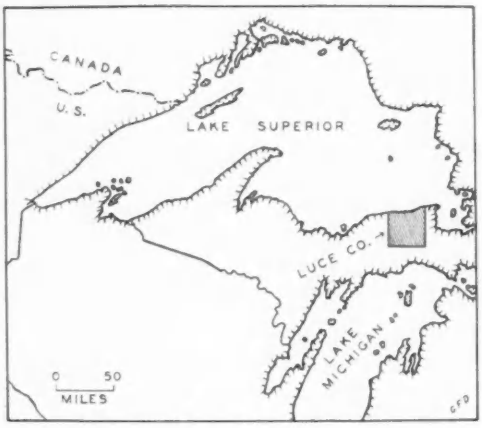


FIG. 1. Luce County, Michigan, is in the Northern Peninsula.

Company works at the present site of Newberry and, as one writer states it, "men came to work at the furnace and so a building was constructed to shelter them." The boarding house, called The American House, was the first known service establishment in Luce County. In the same year, the furnace company built a general store, Vulcan Store, to supply merchandise for its employees and to serve as a temporary post office.

Almost coincident with establishment of the Newberry trade center, there was developing a few miles to the west, along the Detroit, Mackinac, and Marquette Railroad (the present Duluth, South Shore, and Atlantic Railroad), another sales and service center at Dollarville. By late 1882, the new village had a company general store and a boarding house to serve employees of the local lumber mill. As additional lumbering villages (McMillan, Sage, Soo Junction, etc.) were founded along the rail line during the next few years, they too probably acquired the minimal sales and service establishments of a boarding house and a general store.

Stimulated by the expanding Vulcan Furnace Company and other growing industries, and by selection of the village as county seat, sales and service industries in Newberry rapidly increased in numbers until that village became the outstanding trade center of the region. By July 1, 1886, there were at least twenty-two establishments in the village, including two general stores, a dry goods store, a hardware, three groceries, two meat markets, two drug stores, two shoemaker shops, a general contractor's office, four hotels, a millinery shop, an attorney's office, a post office, and a grade school. Several saloons undoubtedly also were in existence at that time, although they are not listed in available sources.

By 1890, eight years after the village was founded, even more numerous sales and service establishments had concentrated in Newberry. A town hall had been built (1887), a court house, jail, volunteer fire department, and school were in operation, three churches (Catholic, Methodist, and Presbyterian) served the spiritual needs of the population, and a large number of private businesses were active. The latter included three general stores, three clothing and dry goods stores, two groceries, a meat market, a bakery, two barber shops, a restaurant, a drug store, a hardware store, two furniture stores, two jewelry stores, a feed store, a harness shop, three wine and liquor stores, five saloons, a blacksmith shop, a bank, five hotels, a livery stable, two drayage establishments, three attorneys' offices, a photographer's establishment, a dentist's office, two physicians' offices, an undertaker's establishment, two newspaper plants, and an opera house. By way of contrast, Dollarville in 1890 had only a grade school, a physician's office, and presumably the general store and boarding house built in 1882; McMillan had only a general store; and Deer Park had only a barber shop, a grade school, a candy and fruit

store, a post office, a fish market, a saloon, and presumably a general store and boarding house. For all other supplies and services, the people of these villages, as well as the scattered farm population in southern Luce County, depended upon Newberry establishments, mail-order houses, and occasional itinerant salesmen who reached these out-of-the-way places in their travels. The position of Newberry as dominant urban center of the region, therefore, was firmly established in early years.

The nature of early living conditions in Luce County, as well as the character of its people, is reflected in types of

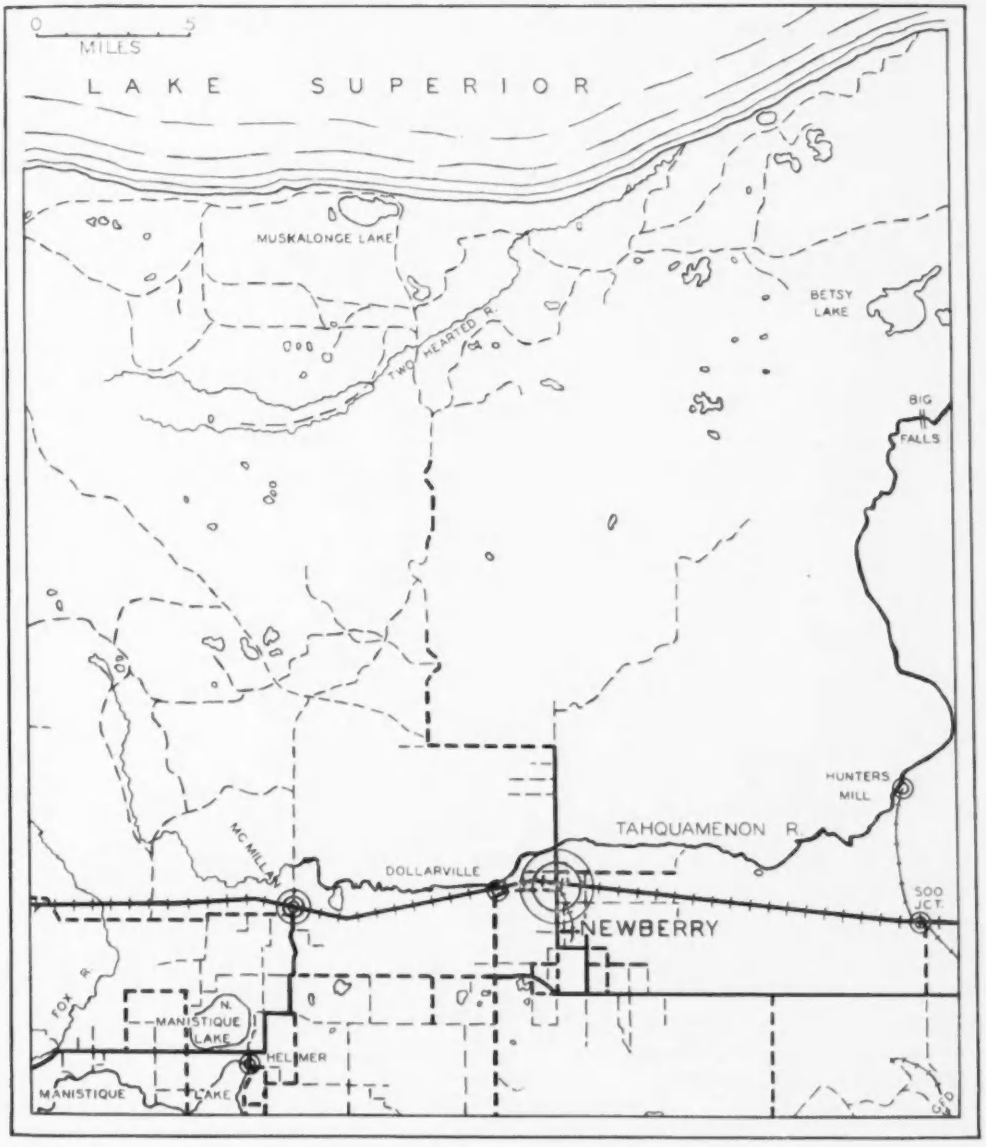


FIG. 2. Luce County: settlements, roads, and railroads, 1946.
The heavy railroad symbol represents the main line of the Duluth, South Shore, and Atlantic Railroad; lighter railroad symbols are spur lines. Hard-surfaced roads are indicated by heavy solid lines, gravel roads by heavy dashed lines, and good dirt roads by light dashed lines. Poor dirt roads are not shown.

sales and service establishments found there. In addition to stores and offices supplying ordinary necessities of life, common personal services, and minimum civic functions, there were certain distinctive types of businesses that reflected somewhat unique social conditions. Five saloons and three wine and liquor stores in Newberry, a village of slightly over 1600 people, testified to the hard-drinking habits of both the town population and the lumbermen from surrounding camps. Two jewelry stores, which placed large advertisements in each issue of the weekly newspapers in evident attempt to catch the eye with flashy baubles, indicate a free-spending people who squandered wages with little thought for the morrow. Claims and counterclaims concerning land titles, homesteading privileges, and lumber and mineral rights necessitated three attorneys to handle such business in the pioneer area. In addition to local attorneys, several out-of-town lawyers advertised in Newberry newspapers, claiming "special attention given to matters relating to homestead grants, agricultural, mining and timber lands." That work in both village mills and adjacent lumber camps was dangerous is revealed by the presence of two physicians in Newberry and one in adjacent Dollarville, as well as by an undertaker who apparently found operations profitable. The typical transient, and predominantly male, population of the pioneer area is reflected in five hotels that were located in Newberry together with company-owned boarding houses in other villages of the county. The insignificant position of the family in the community, with consequent paucity of children, together with the general illiteracy of many workers, is indicated by absence of any but the most rudimentary schooling facilities. Unlike modern urban centers, early villages in Luce County provided practically no public or private amusement and recreation facilities, and people were left to their own devices to find entertainment. Only the "opera house" with its occasional visiting players, and church socials supplied anything approaching organized recreation.

THE INTERMEDIATE PERIOD

Decades following 1890 witnessed the gradual addition of many new establishments in Luce County, the disappearance of others, and the enlargement of some long-established firms. In 1895, a site one mile south of Newberry was selected by the Michigan legislature for the Upper Peninsula Hospital for the Insane, and construction was begun on the main building and the first of several accompanying cottages. The institution ultimately was to become of outstanding economic importance to Newberry, for it furnished not only a considerable market for local services and supplies, but also became the source of employment for large numbers of professional and domestic workers. Other establishments of considerable significance founded in Newberry after 1890 included a poorhouse (1895), an electric power house (1900), a public water system (1900), the Newberry High School (1908), and a large number of private businesses. Villages in Luce County other than Newberry continued unimportant as trade centers, since not only were their wood-working industries declining with the disappearance of virgin forests, but they lacked the stimulus accruing to Newberry from its function as county seat and site of the State Hospital. A few small stores and one or two service establishments remained the typical sales and service facilities of such villages as McMillan, Dollarville, and Soo Junction.

Certain significant changes in the

nature of business establishments occurred between 1890 and the present time, reflecting not only changes in local conditions but also nationwide economic and social trends. Hotels decreased in number, despite gradually increasing county population, as transient non-family woods workers and boom characteristics of the early lumbering period gave way to family-type workers and a more stable economy. Conversely, churches became more numerous as non-religious early lumbermen were replaced by a more orthodox population. Government offices multiplied in conformity with the national trend toward greater governmental control and regulation, the increase in Luce County being further stimulated by the need for preservation of the county's remaining forest and game and by the necessity for rehabilitation of its cut-over lands. Another indication of national change is observed in replacement of harness, livery, and feed stores and blacksmith shops by gasoline stations, garages, and automobile salesrooms. Finally, the saloons that dotted

FIG. 3. Newberry Village and surrounding country, Luce County. (Area covered by photo includes parts of Sections 19, 30, and 31 of T46N, R9W; parts of Sections 22, 27, 34, 35, and 36 as well as all of Sections 23, 24, 25, and 26 of T46N, R10W. Date: September 20, 1939.)

The Duluth, South Shore and Atlantic Railroad follows a curved course across the middle of the photo, skirting the north edge of Newberry. The main north-south road in Luce County runs vertically across the photo and through the center of Newberry. To the north of the railroad are the plants and freight yards of the former Newberry Lumber and Chemical Company, with company-owned cottages for employees lining the main north-south road nearby. A second manufacturing center is located in the southeastern part of the village, and is indicated by the large buildings in that area. The business district of Newberry lies on both sides of the main north-south road (Newberry Avenue) for some six blocks south of the railroad. Much of the remainder of the village is devoted to residences. The Tahquamenon River flows diagonally across the upper left-hand corner of the photo. Farm lands surround Newberry for a mile or less on all sides; beyond extends cut-over forest. (Photo by U. S. Department of Agriculture.)

early villages of Luce County were completely obliterated during the period of national prohibition, from 1920 to 1932. Their place has been taken by less numerous cafes and roadhouses in recent years.

FIG. 4. View south along the main street of Newberry, Luce County.

PRESENT-DAY ESTABLISHMENTS

With the largest population, highest purchasing power, and greatest range of consumer demands in the history of Luce County, sales and service establishments in that area during recent years have attained a maximum in number and variety. Some 160 private and government offices and stores now cater to personal needs of local residents and visitors, affording an array of products and services never before available.

As in previous decades, Newberry village (Figs. 3 and 4) today remains the outstanding sales and service center of the county, 120 of the 160 establishments being located in or on the outskirts of this one village. Of the remaining forty establishments, ten are located in McMillan village, two in Dollarville, and two in Soo Junction village. Twenty-six establishments are scattered about non-urban parts of the county, but nineteen are government owned and operated. Only seven private businesses are in operation outside village limits.

Newberry today is one of six major trade and service centers in the eastern Upper Peninsula. To the east is found Sault Ste. Marie and St. Ignace, while westward lie Manistique, Munising, and Escanaba-Gladstone. In an effort to determine the area in which Newberry dominates trade and service activities, selected establishments in that village were asked to designate on individual maps the territory in which each considered itself dominant in its particular activity. The results are synthesized in Figure 5. With few exceptions, retail stores and private service establishments queried felt that they dominated trade in virtually all of Luce County as well as in narrow marginal zones of adjacent Chippewa, Mackinac, Delta, and Alger counties, to the east, south, and west, respectively. There were exceptions to the general trend, of course, for certain stores and offices reported their territories restricted to but a small part of Luce County. Government agencies located in Newberry, in contrast to private concerns, were mostly limited by law to serving only Luce County or a fractional part thereof, although here too some deviation could be noted from the general situation. For instance, the Newberry Fire Department makes runs southward into Mackinac County, the county agricultural agent at Newberry serves much of Mackinac County also, and the Upper Peninsula Hospital for the Insane receives patients from the entire Upper Peninsula of Michigan. Churches in Newberry have the least extensive service areas, drawing attendance almost exclusively from very restricted sections of south-central Luce County, within a few miles of the village.

Generalizing data for all of the various types of retail sales and service establishments in Newberry, it is possible to construct a map showing the competitive position of that village among

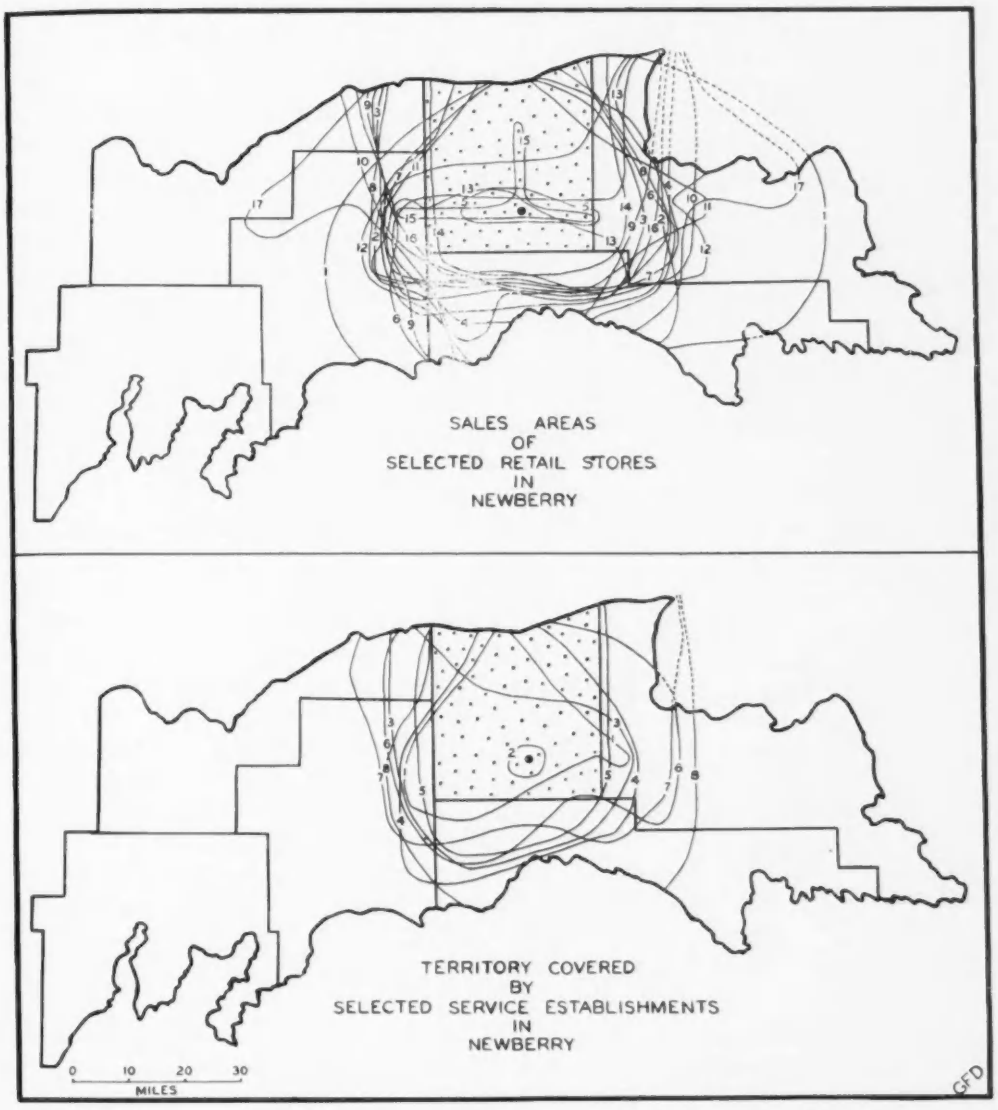


FIG. 5. Sales areas of selected retail stores in Newberry (top); territory covered by selected service establishments in Newberry (bottom). The large dot represents Newberry Village; angular lines are county boundaries in the eastern Upper Peninsula of Michigan. The stippled area is Luce County. Numbered lines indicate areas in which selected individual sales and service establishments in Newberry consider themselves dominant. Data are for 1944.

Numbered lines in the top map represent territory tributary to: (1) Cloverland Bakery, (2) Toms Department Store, (3) The Newberry News, (4) Newberry Dairy Company, (5) William Pillion Restaurant, (6) A & P Tea Company, (7) Newberry Gas and Oil Company, (8) A. L. Newmark's Store, (9) M. Surrell and Son, Chevrolet Service, (10) Wilson Shoe Store, (11) Newberry Photo Service, (12) Berglund Drug Store, (13) Edwards Feed and Poultry Market, (14) A. Westin and Company (general store), (15) Newberry Cooperative Association (groceries), (16) Tahquamenon Dining Car, (17) Horner Lumber Yards.

Numbered lines in the bottom map represent territory tributary to: (1) Newberry State Bank, (2) L. P. Quinlan (drayage,) (3) S. M. Ennis, Insurance Agent, (4) Edd's Radio Electric Service, (5) M. B. Purdy, D.D.S., (6) Laura Kornquist, M.D., (7) Leo Smith (plumbing service), (8) Newberry Clinic.

the several nearby major retail trade centers (Fig. 6, top). A "Core Area," in which all but a few of Newberry's establishments are dominant, includes most of Luce County and very narrow fringes of Chippawa, Mackinac, and Delta counties. Extreme northeastern and northwestern Luce County are not included in this "Core Area," however.

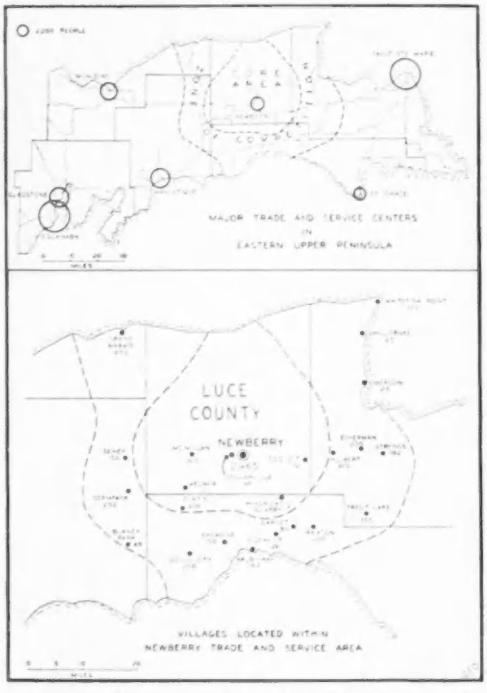


FIG. 6. Major trade and service centers in the eastern Upper Peninsula (top); villages located within Newberry trade and service area (bottom).

Top map: Heavy circles represent major trade and service urban centers with over 2,000 population, the areas of the circles being proportional to population of the towns and villages. Population data are: Escanaba—14,524, Sault Ste. Marie—13,755, Manistique—5,198, Gladstone—5,170, Munising—3,956, Newberry—2,465, St. Ignace—2,109. Dotted lines represent surfaced trunk roads in the eastern Upper Peninsula. The "Core Area" is that region in which most Newberry sales and service establishments are dominant; the "Zone of Competition" is that area in which most Newberry stores and offices are in competition with similar establishments in nearby urban centers. Beyond the latter zone, few Newberry establishments are of significance.

Bottom map: Figures indicate approximate population of villages. Dashed lines correspond with equivalent zonal lines in the top map.

Beyond the central zone is an 8- to 25-mile-wide "Zone of Competition" within which lie most of the boundaries drawn by various Newberry sales and service establishments on their maps. Some Newberry stores and offices are dominant to the outer margin of the zone; territories of others barely reach to its inner margin. Conversely, competing establishments in Sault Ste. Marie, St. Ignace, Manistique, and Munising cover greater or lesser portions of this "Zone of Competition." Beyond the latter zone, few Newberry establishments (other than wholesale firms) are of significance.

The "Zone of Competition" bears a direct relationship to the road pattern of the eastern Upper Peninsula. Since Newberry and its nearby competing urban centers are of somewhat comparable size and afford roughly similar sales and service facilities, trade areas are determined largely by accessibility of the various urban centers. Hence, the "Zone of Competition" consists of areas that are about equidistant by good road from Newberry and one of its competitors. Verification of the principle is furnished by Figure 6, top, which indicates surfaced trunk highways in the eastern Upper Peninsula in relationship to the major trade and service centers of that region.

The large physical size of the area tributary to Newberry belies the small extent of the market therein as measured in terms of purchasing power. Figure 6, bottom, which indicates population of all villages located within the Newberry trade area, shows that Newberry, with 2,465 persons, is its own best market. None of the other tributary villages has a population of more than 762, and most of them have fewer than 200 persons. The largest villages within the "Core Area," in which Newberry virtually has exclusive trading privileges,

are McMillan and Curtis, each with 300 persons. The combined populations of the six villages, exclusive of Newberry, within this central zone is only 834, and even by adding the several hundred farm residents and lumbermen in the area to the figure, the combined totals would be less than one-half that of Newberry. Within the "Zone of Competition" population is considerably larger, seventeen villages having a combined total of 3,763 and the rural areas probably an additional one-third to one-half as many. But it must be remembered that in this zone Newberry merchants and service establishments are facing strong competition from equivalent stores and offices in other urban centers, and are therefore deriving only partial benefit from the large population.

Areas of significance to Newberry, with regard to the purchase and sale of commodities on a *wholesale* basis, are indicated in Figure 7. The top map in the figure indicates localities from which typical retail merchants in Newberry purchase their wholesale supplies. As is evident from the map, most products come from wholesale establishments in Upper and Lower Michigan, Wisconsin, northern Illinois, and southeastern Minnesota—in other words, a region extending roughly 400 to 500 miles south and west from Newberry. Inclusion of territory to the north and east of Luce County is prevented not only by the international boundary, but also by great water expanses of Lakes Superior and Huron and the absence of important commercial centers in much of adjoining parts of Canada. Additional wholesale supplies reach Newberry from such distant centers as New York City, St. Louis, and western Washington and Oregon. Commodities imported include such diverse items as clothing, dry goods and shoes (Detroit, Chicago, Minneapolis, St. Paul, Milwaukee, St. Louis, New York City, and Ripon, Wis.), tobacco and candy (Sault Ste. Marie), groceries (Grand Rapids, Sault Ste. Marie, Marquette, Green Bay, Wis., Detroit, Milwaukee), photographers' supplies (Detroit), drug supplies (Marquette, Sault Ste. Marie, Milwaukee, Chicago), restaurant supplies (Sault Ste. Marie, Marquette), and special types of lumber (Seattle, Tacoma, and Portland, Ore.).

The bottom map in Figure 7 indicates

FIG. 7. Purchase of wholesale supplies by selected retail merchants in Newberry (top); sales areas of selected wholesale establishments in Newberry (bottom).

Top map: Each dot represents a major source of wholesale supplies for one retail store in Newberry. When a store has more than one major source, each of the several sources is indicated by a separate dot. Data are for ten retail stores during 1944. The black square in Upper Michigan is Luce County.

Bottom map: Lines indicate sales areas served by individual wholesale establishments in Newberry. Numbers are as follows: (1) Seven-Up Bottling Company, (2) White Star Northern Oil Company, (3) Barrett Logging Company, (4) Newberry Lumber and Chemical Company, (5) Chesbrough Lumber Company, (6) Robbins Flooring Company, (7) Michigan Pole and Tie Company. Data are for 1938–1944.

areas in which typical wholesale establishments located in Newberry sell their products. As the map reveals, major tributary areas consist of Upper and Lower Michigan, Wisconsin, Illinois, Indiana, and Ohio. Less significant sales areas for wholesale commodities include Pennsylvania, New York, and southern New England. One Newberry establishment has a national market for its products.

THE FUTURE

Future development of sales and service industries in Luce County hinges almost entirely upon changes taking place in basic industries of the tributary area. If lumbering, agriculture, the tourist industry, manufacturing, and the collecting industries prosper, local demands will increase for products and services afforded by stores and offices. If, on the other hand, future years witness decline in the basic economy of Luce County, then sales and service establishments will dwindle in numbers and business will languish. Since one might logically expect moderate but not spectacular development in the overall primary economy of the county within the foreseeable future, it is safe to assume that sales and service establishments will increase in numbers during the next several decades, as they keep pace with gradually expanding basic industries.

With regard to territory tributary to the Newberry trade center, there seems to be little reason to expect significant expansion or contraction in area. Future prospects for competing urban centers—Sault Ste. Marie, St. Ignace, Manistique, and Munising—are dependent upon the same general factors as affect Newberry, since the economy of the entire eastern Upper Peninsula is basically similar. Hence, tendencies toward expansion or contraction of any one urban center would undoubtedly be counteracted by similar and proportionate tendencies in other centers. In addition, the road and rail network of the eastern Upper Peninsula appears to have reached maximum development consistent with ability of the area to support a transportation system. No basic change in accessibility of the several urban centers need be expected, therefore, and thus there would be no cause for a major shift in trade areas of the competing towns on this score.

Newberry will remain the focus of sales and service activities in Luce County in years to come. No other village can match the present advantages possessed by Newberry, including its position as county seat, site of a large state hospital, transportation focus of the county, and center of the area's manufacturing activities. Each of the above factors attracts people, pays salaries, and thus makes Newberry the most concentrated market in the region for goods and service. There appears to be no reason why the advantages should be transferred from Newberry to some other village in the predictable future.

Trends in nature of sales and service establishments in Newberry are difficult to determine on the basis of local factors. Instead, they will be influenced largely by national changes in buying power, tastes, and fancies. If the national standard of living rises, establishments dealing in what now are considered luxury items will increase in number and importance. For instance, engineering advancements and increasing prosperity conceivably might permit general ownership of personal planes, and as a consequence a whole group of sales and service establishments now absent in the county would come into existence. Forecasting such national trends, however, obviously is beyond the scope of this study.

BOOK REVIEWS

The Development of Upland Areas in the Far East. Vol. 1, Part I, China, by PIERRE GOUROU; Part II, The Philippines, by JOSEPH E. SPENCER; Part III, Japan, by GLENN T. TREWARTHA. Published by the International Secretariat, Institute of Pacific Relations, New York, 1949. Mimeographed; $1.00. 11 x 8½ inches.

The common volume title and a single cover are the only features integrating these three essentially separate articles by three different authors. The fact that this is Volume I of what presumably will be a series, together with the quite different approaches of the authors and the lack of integration, indicates that the unity would not suffer whether the parts stood separately or were bound together. The title and cover merely constitute a convenient way of keeping these related articles in one place. This is not a comparative or correlated study of various upland areas in Far Eastern countries.

Each of the three studies is interestingly done. Gourou has the more general and philosophical approach to the problem of land use versus population pressure, the main theme in all three articles. Spencer presents the greatest mass of detail on specific cropping problems, while Trewartha's discussion seems more like a "report on progress" in the Japanese program of land reclamation. All make specific recommendations on changes and improvements in the use of uplands in their respective areas. Nevertheless, since their preoccupation basically is with the problem of population pressure upon available land as a whole, the conclusions inevitably sound a note of gloom.

In describing land use in the vast and widely differing uplands of China, Gourou has difficulty in being specific with regard to regional applications of the problems. The chief failure of the Chinese is that they do not exploit pastureland and forest in a rational manner, according to the writer. The Chinese lack of interest in uplands is explained by their agricultural technique which is an attribute of their vegetable civilization. Since it requires as much work to cultivate poor land as it does to cultivate fertile soil, the peasant is led by his technique to concern himself only with the best lands which repay intensive effort.

The density of population and the relatively small size of fields in rice growing is not the result of physical factors. This must be blamed upon the fact that Chinese culture has chosen to exploit almost exclusively the possibilities of the vegetable kingdom. It is Gourou's contention that the fundamental orientation of China's material civilization must be modified if improvement in livelihood is to be significant. By this he means the development of an interest in the pastoral use of land, in orchards, and in forest and bush crops, all of which would help lead to a rational use of slope lands. Of the 73 per cent of China which lie "unused," if "10 per cent were forested, 10 per cent converted to orchards and bush crops, and 20 per cent into grasslands, a total of 58,000,000" people could be withdrawn from dependence upon cultivated lowlands. Gourou, however, recognizes that "it is as easy as it is ridiculous to indulge in such starry dreams."

In describing land use in the Philippines, Spencer states that three basically separated agricultural systems came into use at an early date, (1) the terraced culture of northern Luzon, which he believes is highly overemphasized in the picturing of Philippine agriculture, (2) the aquatic lowland culture, and (3) the caingin or shifting culture of the central and southern uplands. He lists the chief cropping combinations and suggests certain improved combinations that might be introduced. One of the difficulties in the uplands is the destruction of forests and the growth of a coarse grass which inhibits natural reforestation. Erosion may be prevented, but soil impoverishment is not. As a device for discussion, Spencer draws a comparison between land use and population in the Philippines and in the approximately equal area encompassed by Florida and Georgia.

Unlike Japan and China, the Philippines still have large unexploited arable lands. The increase in the extension of the area cultivated also has been at a more rapid rate than the rate of population increase in the past. Nevertheless, the population increase is so rapid that by A.D. 2000 there will be an estimated need of 35,000,000 cultivated acres, or double the present acreage. This is also about twice the entire land area, and it is evident that the arable land still available is not enough to supply this future need. The writer emphasizes the more immediate problem of feeding the growing population rather than the more basic one of lowering the high rate of population increase. Spencer looks for alternate forms of land use that lie "between some of the present laborious systems of annual cropping of upland terrain and the ideal pattern of protective forestry."

In Japan, by contrast with the situation in the Philippines, the rate of population increase has been greater than the rate of expansion in cultivated area. Whereas in 1877 there were

0.13 hectares of cultivated land per capita, in 1939 there were only 0.083 hectares per capita. Even in absolute area, the cultivated land in 1946 had shrunk to 300,000 hectares less than in 1920. Trewartha agrees with SCAP officials in regarding as unrealistic the Japanese Government's 1948 estimate of 14,000,000 acres of reclaimable land, mostly in slope of considerable steepness. The estimate was not based upon actual field observation, but solely on physical permissibility as shown by 1:50,000 scale topographic maps.

Like Gourou, Trewartha sees that a greater diversification of the diet is needed, including the increased use of maize, to transform the cultural reluctance to cultivate unirrigated crops. Though lack of pasture and other obstacles offer deterrents to dairying, the breeding of stock to supply other Asiatic areas is a possible use for Japan's uplands. Multiple cropping on uplands can be increased by more extensive use of fertilizers. However, in spite of an ambitious reclamation program and various possible increased uses of uplands, these are offset by the population increase. Unless other food sources can be tapped, by 1960 there will be a food intake deficit of 25 per cent. The author concludes that it is unlikely that Japan can become self-sufficient in food.

HEROLD J. WIENS
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Antioqueño Colonization in Western Colombia, by JAMES J. PARSONS. 225 pp.; maps, tables, plates, notes, bibliog. Ibero Americana No. 32. University of California Press, Berkeley and Los Angeles, 1949. $3.00. 6 x 9¼ inches.

This monograph is a welcome addition to the scant geographical literature on modern culture areas of Latin America. As the title indicates, the paper deals with the origin and spread of the Antioqueño people and their economy in the rugged Andes of western Colombia.

After describing the natural setting and original Indian inhabitants, the author traces the Spanish settlement of colonial Antioquia. The Spaniards first occupied the hot lands of the lower Cauca, where, using Negro slave labor, they washed gold from placer deposits. During the 17th century settlement based on stock raising, farming, and gold placering occurred in the temperate Valley of Aburrá (where Medellín was founded) and on the higher plateau surface to the east. These isolated areas became the culture hearth of the Antioqueño. The end of the 18th century saw the beginnings of southward pioneer expansion of the Antioqueño out of his crowded homeland. Throughout the 19th century and the early part of the present, expansion took place along the *tierra templada*, or middle slopes of the cordilleras, a belt above the malaria zone and below the *páramo*. Colonization of the temperate slopes to the south continues today, but at a slackened pace, and has reached beyond the latitude of Cali. The early pioneers looted Indian graves for gold, cleared small plots in the dense sub-tropical forest, planted maize, and raised hogs, which they drove down to the *tierra caliente* markets along the Cauca River. Maize fields were usually converted to grass for grazing the typical white Antioqueño cattle. In this manner the virgin forest of the mountain slopes was almost destroyed and replaced by grass. Antioqueño colonization received a new impetus with the introduction of coffee planting in the 1880's. The maize-hog farmer became a small-scale coffee planter, and subsequent settlement was based mainly on coffee. The Antioqueños settled in dispersed farmsteads on small holdings, usually as homesteaders on public lands, but often as squatters on unused portions of landed estates. Supply towns (e.g., Manizales, Sevilla) were founded on ridge sites overlooking the Cauca Valley.

Parsons emphasizes the agricultural basis of occupance, and describes the typical Antioqueño food crops and habits, the importance of livestock and milk products, and the role that introduced grasses have played in improving pastures and protecting deforested slopes from serious erosion. Appropriately, an entire chapter is devoted to the significance of coffee planting in modern Antioqueño economy. The section on transportation brings home the isolation which until rather recently characterized mountain-bound Antioquia. Parsons ends his analysis of Antioqueño colonization with a description of recent industrialization (mainly textiles) that is under way in the Medellín and Manizales areas, which are drawing increasing numbers of farmers to the urban centers.

As his notes and bibliography indicate, Parsons uses data gained not only from libraries, but also from extensive field work and from unpublished documents in Colombian archives. Many well-executed maps illustrate various distributions and cultural movements, and half-tone plates at the end of the volume depict aspects of the Antioqueño landscape.

To the reviewer Parsons' monograph seems significant especially on two counts. First, it deals with a colonizing people of Spanish descent who are characterized by extraordinary pioneering energy. Antioqueño colonization offers one of the few instances in Latin American settlement of the conquest of woodlands by small farmers of Spanish heritage, who created an "anomaly of a democratic society of small holders on a continent dominated by traditional Latin latifundia." Secondly, Parsons has succeeded in presenting a regional geographical study from the point of view of culture history. American cultural geographers have too often

permitted the physiographic region to determine their choice and limits of regional study, and have relegated historical treatment to one of the "explanatory factors" of the cultural landscape. The limits of Antioqueño culture define Parsons' area of study; historical development is the method of presentation. As such the study is of value to historians, sociologists, and cultural anthropologists, as well as to geographers.

ROBERT C. WEST
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The Invasion of New Zealand by People, Plants, and Animals: South Island, by ANDREW H. CLARK. xiv and 465 pp.; maps, ills., tables, bibliog., index. Rutgers University Studies in Geography, No. 1, Rutgers University Press, 1949. $6.00. 9¼ x 6 inches.

In this "report on a revolutionary change in the character of a region" Professor Clark makes a strong case for the need to dig deep into the record of the past if one is to understand present-day patterns and problems of land use. His own digging has obviously been thorough, and in the opinion of this reviewer eminently successful.

This book is not only well organized and well illustrated, but, what is perhaps less common in much of our scientific writing, well written. The picture of New Zealand as it was in various stages of its growth and as it is now unfolds vividly, meaningfully, and entertainingly from start to finish. Little of real import in connection with the historiography of land use on the island has escaped the author's attention. While there is a good deal of historical and geographical detail, Professor Clark throughout has been careful to point out at every step just why he considers it *relevant* detail. This reviewer, who spent a year studying, teaching, and traveling in New Zealand shortly before Professor Clark's visit, has been able to discover no serious errors either of commission or omission.

The book is organized in five sections. In the first section, titled "The Land," the author discusses features of the physical geography of the South Island that have had important bearing on evolving patterns of land use and misuse: geographical location, land forms, drainage features, climates, soils, native fauna and flora. In the second part, "The People," he considers Polynesian occupation and early European contacts, the flow of settlement after 1840, and the changing character and distribution of the population. The third section treats with the culture hearth (essentially Great Britain) and the invading animals including sheep, cattle, "minor domesticated animals," and animal pests—always in relation to their impact on the land and the people who have inhabited it. The fourth part refers to the place of plant husbandry, and more specifically to potatoes, wheat, the Brassicas, grasses, and clovers, and the exotic trees and shrubs including those which have been outstandingly useful and those which have developed into plant pests of serious import to the future of grazing and agriculture in the region. In the last section the author sums up his case and presents appendices, reference notes, statistical source materials, selected bibliography, and index.

Since it has not been Professor Clark's announced purpose to write a physical geography of New Zealand it is hardly fair to criticize the rather brief treatment of mineral resources, water supply, climates, soils, and the like in this work. As far as such treatment goes it is excellent in presenting the over-all picture, and in selecting relevant detail. If the physical geographer might like to see a little more space devoted to the habitat, so too might the economic geographer like more emphasis on the interrelationships of economic activities in the various parts of the island, and the political geographer more concern with the role of provincial and Home governments in the guidance of evolving patterns of land use and land deterioration. But this would have added materially to the costs of publication without adding much to the primary, modest objective which as stated by Professor Clark is simply "to introduce students to some problems in the historical geography of the South Island of New Zealand." In these terms the book accomplishes exactly what it purports to accomplish. There is more to be investigated. This is a good start.

The author's industry in assembling such a wealth of data, and his discrimination in the selection of that which is clearly pertinent, are to be commended especially. Typographical errors are few and far between ("Manapouri" is spelled "Manopouri" on one map—a pardonable error in view of the unfamiliarity of Maori place names) and the whole work shows extremely careful and judicious editing.

ROBERT G. BOWMAN
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Études sur la Banlieue de Paris: Essais Méthodologiques, by PIERRE GEORGE, M. AGULHON, L. A. LAVANDEYRA, H. D. ELHAIR, AND R. SCHAEFFER. 183 pp.; maps, charts, tables, bibliogs. Cahiers de la Fondation Nationale des Sciences Politiques, No. 12, Libraire Armand Colin, Paris, 1950. 350 francs. 9½ x 6 inches.

This is one of a dozen publications of the National Foundation of the Political Sciences, established in 1945 under the presidency of Professor André Siegfried, with the object of advancing research in the political, economic, and social sciences. It includes geographers among its members (in addition to the president,

the most distinguished exponent of its particular field of interest), and indeed one of the noteworthy features for us to note is the strong geographical flavor of its researches and particularly the active part which Professor Pierre George, geographer of the Sorbonne, is taking in their direction. Several of these studies have been concerned with the geographical differences of political attitudes, as evidenced primarily by voting habits, and their relations to the mode of living and historic development. This particular volume contains four contributions on various sectors of the urban periphery of Paris, with an introductory essay by Professor George. Professor George hopes that these exemplary studies will lead to an extension of their objectives to the whole urban periphery and so to better understanding of the human problems of great urban agglomeration and assist in their solution.

Professor George discusses the contrast in demographic, social, and economic structure between the city of Paris and the urban periphery or *banlieue*. His concern is with the "human content" of the urban areas and this, he says, is inseparable from the modes of employment and the daily movements of the people and their places of origin. He points out the need for very detailed maps, wherever possible lot by lot, of types of urban structure, occupations, enterprizes, population, demographic data, voting habits, and the places of origin of inhabitants. Such maps would serve as a basis for understanding and solving the human problems of the communities of the city and the suburban areas. Four essays follow on sectors of the urban periphery as examples of the method and purpose of such investigation. M. Agulhon examines the historical transformation of a district from a rural village to a suburban commune and shows the repercussions of this development on the changing political attitudes of the community. M. Lavandeyra deals at length with a dormitory community of 50,000 inhabitants. He examines in detail the nature of the daily migrations of workers and then passes to a study of the demographic, social, and economic conditions of the community, and, finally, to the ways in which these are reflected in political attitudes. This is an excellent ecological study and is illustrated by appropriate maps. The work was directed by Professor George. M. Elhai deals more briefly with an area of modern multistoried apartment blocks built for low income groups (*Habitations a Bon Marché*) in which certain distinctive modes of living and attitudes are discovered. Finally Professor George has reproduced the maps of a Brazilian geographer-student, Mme. R. Schaeffer, showing the location of the residences of the workers of a large industrial plant.

These essays are of particular interest and importance for two reasons. Together with others in the series (as well as the similar works of Professor Siegfried on western France and the Department of Ardèche), the geographic approach throws new light on the variations of political attitudes from one area to another and their dependence on the life and attitudes of human populations, through modes of study that technically lie in the borderlands of the social sciences. They also provide current examples in Europe of the kind of research that is described as "human ecology" by American sociologists and "social morphology" by such French sociologists as M. Halbwachs. It is the geographer who is taking the lead in promoting these French studies as a means to understanding the life and problems of urban societies and rectifying their maladjustments.

ROBERT E. DICKINSON

Syracuse University

Human Ecology—A Theory of Community Structure by AMOS H. HAWLEY. xvi and 456 pp.; maps, diagrs., tables, supplementary references, index. Ronald Press, New York, 1950. $5.00. 9 x 6 inches.

This work claims to be a study of the form and development of community structure of human society, with particular reference to the limiting and supporting factors of the environment, in which environment is defined as the sum total of external forces that affect the life of the community (pp. 66–7). Its scope is inevitably in large measure synonymous with human geography, much more so than the author apparently realizes. For the geographer, the book contains much old wine in new bottles, but it also has much that is new and stimulating. Indeed, it is gratifying to find acknowledgment to geographers in its pages, although these are mainly the names of Ratzel and Semple and a few contemporary American geographers. There is, however, little appreciation of the factual contributions of outstanding geographers, such as M. Sorre and A. Demangeon, to the understanding of human society in its ecological aspects. Sociologists have produced a formidable research literature in human ecology during the last 25 years. But human geographers (as well as anthropologists) have made substantial contributions too, and it is high time that, especially in the field of human ecology, there was more effective cross-fertilization than has hitherto been the case.

Part I deals with the general theory of ecology and its relations to human ecology, which is defined as "the study of the form and the development of the community in human population," the organization of which "pertains to the total fabric of dependences that exist within a population" (p. 179). The community is the basic unit of this ecological investigation. Hawley departs from Mackenzie's earlier definition of human ecology as the study of the

"spatial aspects of the symbiotic relations of human beings and human institutions." As conceived by Hawley, the field goes far beyond the spatial structure of society, to embrace the patterns or "niches" of functional relationships in society, as, for example, all kinds of mutual aid from the household or kinship group upwards. Geographers will undoubtedly be provoked by the following statement: "Human ecology fastens its attention upon the human interdependences that develop in the action and reaction of a population to its habitat. In other words, while geography views the adjustment of man from the standpoint of modifications of the earth's surface, human ecology makes a detailed analysis of the process and organization of relations involved in adjustment to environment. Geography involves a description of things as they are at a point in time; its interest is in distribution rather than development. Ecology, on the other hand, is evolutionary—the one proceeds by way of environment, the other by way of organism" (p. 72). This assertion is contrary to the trends of recent geographic thought. Geography is equally interested in development and function in explaining the areal associations of phenomena on the earth's surface.

Part II on the Human Aggregate contains some discussion of the natural area and the cultural area. The former is described—and we believe, in the light of current geographic work, rightly so—as the habitat (or land) plus the biotic community. But the implication that the geographer is only concerned with human society in so far as it shows correspondences with natural areas and that the areal differentiations of Society *per se* are not wi hin its practice or field of special knowledge, is untrue. Chapters on the growth and composition of population are followed by a discussion of Population Balance which is particularly interesting and valuable to the human geographer. It is shown that there are three variables in the level of living in a population—numbers, subsistence and resources, and organization; and that overpopulation in an area is to be measured in the last analysis not by the relation of population to its resources, but by the relation of numbers to available work or employment.

Part III deals with ecological organization of human society. Its basic theme is that "Population responds to the various conditions of environment through differentiation and organization," so that the human community "is an organization of differences and similarities" (p. 182). These differentiations are physiopsychological and territorial. The former depend on sex, age, race, etc.; herein lies a field of investigation that is not a direct concern of the geographer. But the study of the territorial differentiation is the core of human geography. Hawley writes "Each habitat not only permits but to a certain extent necessitates a distinctive mode of life" (p. 190), especially among the simple societies. A distinction is made between "the physical density" of population and the "social density," the former referring to number of people per unit of area, the latter to "the frequency of contacts among the members of a population." The measurement of social density and its resultant effects on the areal structure of society is also a geographic problem, as many research studies testify. The terms "movement" and "circulation" are both used as in geographic work. Community structure is examined in Chapter 12, in which corporate groups (based on symbiotic relations) and categoric groups (based on commensalistic relations) are the basic concepts of the treatment. Corporate units include the family and its various types, assocional units (common functional groups), and territorial units. Categoric units are groups of common function, interest, and organization. Examples are drawn from independent communities (with negligible contact with the outside world) and dependent communities (specialized functional communities that are dependent on outside sources for many of their needs).

The spatial pattern of human activities receives attention in Chapter 13. Such a pattern exists, says Hawley, because of the interdependence of men, the dependence of activities upon the nature of the land, and the friction or resistance of space to movement. From this springboard he turns to the community center and the community area at various levels from hamlet to city. The spatial arrangement of the urban complex is considered on lines that are already familiar in other works. Chapter 15 is an interesting attempt to analyze the temporal elements of ecological organization, and is concerned mainly with the reckoning of time as a factor in the life of human societies. In the whole of this section a great deal of relevant geography is not touched.

Section IV deals with Change and Development—the field which is claimed to be "evolutionary" and a special concern of the ecologist and (quite wrongly) a minor interest of the geographer. Mobility and change are examined in terms of an analysis and classification of migrations, which are described as recurrent and nonrecurrent in type. "Interregional organization" (Ch. 18) is interpreted as the succession of changes in the peopling of major land areas. The expansion of the city (Ch. 19) is examined in terms of its growth in size and function, and the differentiations of its parts, and there is a rather brief treatment of the expansion of the "community" within the city. There is little new in these chapters though the material is well presented. Its basic concepts come close to the geographer's concepts of "sequent occupance" and "areal differentiation," but there is no reference here to geographic works.

This book, then, is a broad introductory presentation of principles and hypotheses, with examples. It is often tentative, and necessarily so, as the writer wisely mentions in the preface. The reviewer's own reaction, coming to this book immediately after reading the first two volumes of M. Sorre's *Fondements de la Géographie Humaine*, is that the human ecologist can learn much from the concepts and studies of contemporary, and especially European, geographers. This, however, cuts both ways, and the human geographer is urged to give this book careful reading since so many of its concepts and problems are basically geographic. And let the social scientist in the formation of his general principles and in his approach to new research problems in human ecology take careful stock of current trends of geographic researches.

ROBERT E. DICKINSON

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The Structure of the Metropolitan Community, a Study of Dominance and Subdominance, by DON J. BOGUE. x and 210 pp.; maps, diagrs., tables, charts, index. Horace H. Rackham School of Graduate Studies, Univ. of Mich., 1949. $2.00. 11 x 8½ inches.

In the past thirty years, theories of the dominance of large metropolitan cities over their surrounding regions have been advanced, notably by N. S. B. Gras and R. D. McKenzie. In this study, Bogue attempts to verify statistically the dominance of such metropolitan cities within the United States. He has taken tiers of counties surrounding 67 central cities and has condensed the statistics into a number of tables and charts. It is from the chapter on methods that one must determine whether the procedure used justifies the conclusions that are drawn. If metropolitan regions exist, Bogue postulates, they will show themselves by a distinctive pattern of population distribution and a division of labor in the hinterland. "If these differences in distribution are directly related to conditions which can be attributed to the influence of the metropolis and *if nothing else in the environment* requires the same distribution, then it can be inferred reasonably that the metropolis is exercising dominance over the area" (italics are those of the reviewer). As Ullman has pointed out, metropolitan centers often are situated in the hearts of productive areas with less fertile and sparsely utilized hinterlands. It appears, then, that both the "environmental" pattern and the central place theory of the location of cities reinforce the distributions which Bogue claims are due only to metropolitan dominance. How much this coincidence affects the results is difficult to determine since data for individual regions are not given.

Dr. Bogue has further divided his data for the hinterland into twelve sectors of 30° each radiating from the central city. These divisions were listed as intermetropolitan, subdominant, or local, depending on the major routes and cities appearing in each sector. Fitting the data into such a framework has meant assigning counties to specific sectors despite the fact that they might extend over several sectors. Why every hinterland was expected to conform to the pattern of twelve is not clear. The number of sectors in fact seems to depend upon the size of the central city, its physical situation, and the historical development of the transportation routes. A vast amount of quantitative data has been gathered and synthesized in the text to support the thesis.

The absence of a bibliography is a hindrance to the student, particularly in trying to study the genesis of the procedure used. The works of von Thünen, Reilly, Christaller, Brunner and Kolb, Loesch, Dickinson, and Ullman, among others, would have been of great value in designing the study. Whether they were consulted, one has no way of knowing. The geographer would also have appreciated seeing the maps which were necessarily used in preparing the data. Presumably, limitations of space barred their inclusion.

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